

Dynamic Metadata - Soil Interpretation Descriptions

While, in general, this database will most likely contain data for only one soil survey area, this database can import data for more than one soil survey area. The set of interpretations generated for each soil survey area may not be identical. Therefore, an interpretation described in this report may not have been generated for all soil components in this database.

These interpretation descriptions were originally recorded in the master NASIS database using a fixed width font in conjunction with the use of tabs. Some of the original tables contained in these descriptions lost their formatting in the transfer to this database, making them very difficult to read.

Interpretation Name: **AWM - Irrigation Disposal of Wastewater**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for surface or sprinkler irrigation systems, waste product attenuation, plant growth, or natural decomposition processes than disposal of wastewater by irrigation has application, environmental or health limitations.

Part 620 - Soil Interpretations Rating Guides 620(430-VI-NSSH, 1993)

(a) General.

(1) Soil interpretations for waste management provide a means to use organic wastes and waste-water as productive resources. Using these resources will result in energy conservation, prevent waste, and minimize problems associated with their disposal. The planned use of many wastes has proven beneficial to the producer and the user of these by-products. The characteristics of the soil are important in the application of organic wastes and wastewater to land for fertilization and irrigation. They are also important considerations if the soil is used as a medium for the treatment and disposal of these wastes. Favorable soil properties are required to prevent environmental damage.

(2) The interpretation guides for wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purposes of these guides, they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand (BOD) content. The rating are for each soil in its present condition and do not consider present land use. The suitability ratings provided for each interpretation are based on the influence of existing soil properties on the use. For each soil rated, the degree of suitability and the most restrictive features that affect the proposed use are identified. The restrictive features are identified for each moderate or severe suitability rating as it affects use and performance for the desired purpose. Thus the user can develop alternatives for use and management.

(3) These guides are designed for the management of defined classes of organic wastes and wastewater, whether or not the objective is treatment for utilization by a crop^{1/} (as with manure and food processing wastes, municipal sewage sludge, and wastewater used for irrigation); treatment without regard to crop needs (such as treatment of water by the slow process, treatment of water by the overland flow process, and treatment of water by the rapid infiltration process); or land reclamation (as with carbonaceous materials used as a soil conditioner and stabilizer). Not considered in these guides, but important in evaluating a site, are allocation and accessibility of the area, size and shape of the area, and use and management of the treatment area. Geology, hydrology, and climate are considered only to the extent that they are reflected in the kind of soil mapped. Waste quality and rate of application are considered to the extent that they are within the "safe" limits as recommended in such publications as Application of Sewage Sludge of Cropland--Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals, November 1976, MCD-33, EPA 430/9-76-013; Municipal Sludge Management--Environmental Factors, October 1977, MCA-28, EPA 430/9-77-044; Criteria for Classification of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol. 44, No. 179, September 13, 1979, pp. 53460-53464; and Process Design Manual for Land Treatment of Municipal Wastewater, October 1977, EPA 625/1-77-008, or within the regulatory guidelines adopted by the individual state(s) if the state regulation is more restrictive.

(4) This section contains guides for interpreting soils for use in the management of manure and food processing wastes; the management of municipal sewage sludge; the management of wastewater used for irrigation; the treatment of wastewater by the slow rate process; the treatment of wastewater by the overland flow process; the treatment of wastewater by the rapid infiltration process; and the management of carbonaceous material as a soil conditioner and stabilizer. Wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purpose of these guides they are not considered to be wastewater unless the water content is more limiting the to rate of application than the nutrient or biochemical oxygen demand content.

^{1/} The type of crop that can be grown and its utilization for human or animal consumption may be specified by local, state, or county health regulations.

(b) Disposal of wastewater by irrigation.

(1) The wastewater considered in this guide is municipal wastewater and wastewater from food processing plants, lagoons, and storage ponds. Municipal wastewater is the water in the waste stream from a municipality. It contains domestic waste and, in some areas, includes industrial waste. It may be untreated, although this is rare, or it may be wastewater that has received primary or secondary treatment. Food processing wastewater is the wastewater resulting from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In some places it has a high content of sodium and chloride. Lagoon and storage pond effluent, as discussed in this guide, refer to the effluent from facilities used to treat or store domestic wastes, wastewater from food processing, or liquid animal wastes. The effluent from a municipal or food processing plant lagoon or storage pond commonly is very low in carbonaceous and nitrogenous matter. The nitrogen content ranges from 10 to 30 mg/l. The effluent from animal

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Irrigation Disposal of Wastewater**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

waste treatment lagoons or storage ponds have much higher concentrations of these materials mainly because the manure has not been diluted as much as domestic wastes. The nitrogen content varies considerably but generally is from 50 to 2,000 mg/l.

(2) Some wastewater may cause an increase in sodicity or salinity in the soils in arid and semiarid regions but it generally does not in humid regions. The heavy metal contents of effluents are usually low; however, chemical analyses should be made prior to use.

(3) The soil properties and qualities that are listed in 1993 Criteria Table, need to be considered in the design, construction, management, and performance of wastewater irrigation systems. The soil properties and qualities important in design and management are the sodium adsorption ratio, depth to a seasonal high water table, the available water capacity, permeability, wind erodibility, erosion factor, slope, and flooding. The soil properties and qualities that influence construction are stones, depth to bedrock or to a cemented pan, and depth to a seasonal high water table. The properties and qualities that affect performance of the irrigation system are depth to bedrock or to a cemented pan, bulk density, the sodium adsorption ratio, salinity, and soil reaction. The cation exchange capacity also affects performance, and it is used here as an estimate of the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suited to irrigation.

(4) The soil rating guide is based on the utilization of the water for crop production and is not directed toward only the disposal or treatment of the wastewater. Checks should be made to ensure that heavy metals, nitrogen, and other salts are not added in excessive amounts.

1993 Criteria Table: Disposal of Wastewater By Irrigation.

	LIMITS	RESTRICTIVE	
PROPERTY	SLIGHT	MODERATE	SEVERE FEATURE
1.	USDA TEXTURE	---	ICE PERMAFROST
2.	SODIUM ADSORPTION	<4 4-13	>13 EXCESS SODIUM RATIO
3.	SALINITY (SURFACE	<4 4-8	>8 EXCESS SALT LAYER, MMHOS/CM)
4.	SLOPE	<3 3-8	>8 SLOPE (SURFACE, PCT)
4a.	SLOPE	<6 6-15	>15 SLOPE (SPRINKLER, PCT)
5.	PONDING	---	---
6.	DEPTH TO HIGH	>4 2-4	<2 WETNESS WATER TABLE (FT)
7.	DEPTH TO BEDROCK	>40 20-40	<20 DEPTH TO ROCK (IN)
8.	DEPTH TO CEMENTED	>40 20-40	<20 CEMENTED PAN PAN (IN)
9.	PERMEABILITY	---	2.0-6.0 >6.0 POOR FILTER (IN/H)
9a.	PERMEABILITY	0.6-2.0 0.2-0.6	<0.2 PERCS SLOWLY (0-60", IN/H)
10.	AVAILABLE WATER	>6 3-6	<3 DROUGHTY (WEIGHTED AV. TO 60", IN)
11.	STONINESS CLASS	1 2 3, 4, 5	TOO STONY
12.	WEIGHT PERCENT	<15 15-35	>35 TOO COBBLY 3-10" (SURFACE LAYER)
12a.	WEIGHT PERCENT	<5 5-15	>15 TOO STONY >10" (SURFACE LAYER)
13.	FLOODING	NONE, RARE OCCAS	FREQ FLOODING
14.	SOIL REACTION (pH)	>6.5 5.0-6.5	<5.0 TOO ACID
15.	CLAY ACTIVITY	>.15 .05-.15	<.05 LOW ADSORPTION (CEC/CLAY)

Interpretation Name: **AWM - Land Application of Municipal Sewage Sludge**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Land Application of Municipal Sewage Sludge**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for waste product attenuation, plant growth, or natural decomposition processes than land applications of municipal sewage sludge has environmental and health limitations.

Part 620 - Soil Interpretations Rating Guides 620(430-VI-NSSH, 1993)

(a) General.

(1) Soil interpretations for waste management provide a means to use organic wastes and waste-water as productive resources. Using these resources will result in energy conservation, prevent waste, and minimize problems associated with their disposal. The planned use of many wastes has proven beneficial to the producer and the user of these by-products. The characteristics of the soil are important in the application of organic wastes and wastewater to land for fertilization and irrigation. They are also important considerations if the soil is used as a medium for the treatment and disposal of these wastes. Favorable soil properties are required to prevent environmental damage.

(2) The interpretation guides for wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purposes of these guides, they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand (BOD) content. The rating are for each soil in its present condition and do not consider present land use. The suitability ratings provided for each interpretation are based on the influence of existing soil properties on the use. For each soil rated, the degree of suitability and the most restrictive features that affect the proposed use are identified. The restrictive features are identified for each moderate or severe suitability rating as it affects use and performance for the desired purpose. Thus the user can develop alternatives for use and management.

(3) These guides are designed for the management of defined classes of organic wastes and wastewater, whether or not the objective is treatment for utilization by a crop^{1/} (as with manure and food processing wastes, municipal sewage sludge, and wastewater used for irrigation); treatment without regard to crop needs (such as treatment of water by the slow process, treatment of water by the overland flow process, and treatment of water by the rapid infiltration process); or land reclamation (as with carbonaceous materials used as a soil conditioner and stabilizer). Not considered in these guides, but important in evaluating a site, are allocation and accessibility of the area, size and shape of the area, and use and management of the treatment area. Geology, hydrology, and climate are considered only to the extent that they are reflected in the kind of soil mapped. Waste quality and rate of application are considered to the extent that they are within the "safe" limits as recommended in such publications as Application of Sewage Sludge of Cropland--Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals, November 1976, MCD-33, EPA 430/9-76-013; Municipal Sludge Management--Environmental Factors, October 1977, MCA-28, EPA 430/9-77-044; Criteria for Classification of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol. 44, No. 179, September 13, 1979, pp. 53460-53464; and Process Design Manual for Land Treatment of Municipal Wastewater, October 1977, EPA 625/1-77-008, or within the regulatory guidelines adopted by the individual state(s) if the state regulation is more restrictive.

(4) This section contains guides for interpreting soils for use in the management of manure and food processing wastes; the management of municipal sewage sludge; the management of wastewater used for irrigation; the treatment of wastewater by the slow rate process; the treatment of wastewater by the overland flow process; the treatment of wastewater by the rapid infiltration process; and the management of carbonaceous material as a soil conditioner and stabilizer. Wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purpose of these guides they are not considered to be wastewater unless the water content is more limiting the to rate of application than the nutrient or biochemical oxygen demand content.

^{1/} The type of crop that can be grown and its utilization for human or animal consumption may be specified by local, state, or county health regulations.

(b) Land application of municipal sewage sludge.

Municipal sewage sludge as used in this guide is the residual product of the treatment of municipal sewage. The solid component is composed mainly of cell mass, primarily bacteria cells which have developed during secondary treatment and which have incorporated soluble organics into their own bodies. Sludge also contains small amounts of sand, silt, and other solid debris.

(1) Municipal sewage sludges have a variable nitrogen content. Some sludge contains constituents that are toxic to plant growth or hazardous to the food chain (such as heavy metals or exotic organic compounds) and should be chemically analyzed prior to use.

(2) The water content of sludge ranges from about 98 percent to about 40 percent or less. The sludge is called liquid if it is more than about 90 percent water, slurry if it is about 90 to 50 percent water, and solid if it is less than about 50 percent water. Depending on the water content, the sludge can be moved by pump, conveyor, or auger.

(3) As shown in 1993 Criteria Table, the soil properties and qualities considered in rating the degree of limitation are those that affect soil absorption, plant growth, microbial activity, the susceptibility to wind or water erosion, and the rate and method of application. Soil properties and qualities that affect absorption are permeability, the depth to a seasonal high water table, soil reaction, sodium adsorption ratio, salinity, and bulk density. They also affect plant growth and microbial activity. Slope and the susceptibility to flooding are used to measure the potential for water erosion. Stones and the depth to a seasonal high water table can interfere with the application. Stones and the depth to a seasonal high water table

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Land Application of Municipal Sewage Sludge**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

can interfere with the application

(4) The soil rating guide is based on utilizing the nutrients in the waste for crop production and is not directed toward reclaiming or restoring critical areas or making the most efficient use of moisture. Applications of slurry sludge can be by tank wagon or by irrigation equipment that is modified as necessary to function properly. Applications of solid and slurry sludges can be made at the surface or subsurface.

1993 Criteria Table: Land Application of Municipal Sewage Sludge.

	LIMITS	RESTRICTIVE	
PROPERTY	SLIGHT	MODERATE	SEVERE FEATURE
1. USDA TEXTURE	---	---	ICE PERMAFROST
2. PERMEABILITY	---	2.0-6.0	>6.0 POOR FILTER (0-60", IN/H)
2a. PERMEABILITY	.6-2.0	.2-.6	<.2 PERCS SLOWLY (0-60", IN/H)
3. PONDING	---	---	+ PONDING
4. DEPTH TO HIGH	>4	2-4	<2 WETNESS WATER TABLE (FT)
5. SLOPE (PCT)	<8	8-15	>15 SLOPE
6. DEPTH TO BEDROCK	>40	20-40	<20 DEPTH TO ROCK (IN)
7. DEPTH TO CEMENTED	>40	20-40	<20 CEMENTED PAN PAN (IN)
8. SODIUM ADSORPTION	<4	4-13	>13 EXCESS SODIUM RATIO (0-20")
9. SALINITY (SURFACE	<4	4-8	>8 EXCESS SALT LAYER, MMHOS/CM)
10. FLOODING	NONE	RARE	OCCAS, FREQ FLOODING
11. CLAY ACTIVITY	>.15	.05-.15	<.05 LOW ADSORPTION (CEC/CLAY; 0-20")
12. AVAILABLE WATER	>6	3-6	<3 DROUGHTY (WEIGHTED AV. 0-60", IN)
13. STONINESS CLASS	1	2	3, 4, 5 TOO STONY
14. WEIGHT PERCENT	<15	15-35	>35 TOO COBBLY 3-10" (SURFACE LAYER)
14a. WEIGHT PERCENT	<5	5-15	>15 TOO STONY >10" (SURFACE LAYER)
15. SOIL REACTION (pH,	>6.5	5.0-6.5	<5.0 TOO ACID SURFACE LAYER)

Interpretation Name: **AWM - Manure and Food Processing Waste**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for manure and food processing waste attenuation, plant growth, or natural decomposition processes than land applications of manure and food processing waste has environmental and health limitations.

Part 620 - Soil Interpretations Rating Guides 620(430-VI-NSSH, 1993)

Waste Management.

(a) General.

(1) Soil interpretations for waste management provide a means to use organic wastes and waste-water as productive resources. Using these resources will result in energy conservation, prevent waste, and minimize problems associated with their disposal. The planned use of many wastes has proven beneficial to the producer and the user of these by-products. The characteristics of the soil are important in the application of organic wastes and wastewater to land for fertilization and irrigation. They are also important considerations if the soil is used as a medium for the treatment and disposal of these wastes. Favorable soil properties are required to prevent environmental damage.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Manure and Food Processing Waste**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

(2) The interpretation guides for wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purposes of these guides, they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand (BOD) content. The rating are for each soil in its present condition and do not consider present land use. The suitability ratings provided for each interpretation are based on the influence of existing soil properties on the use. For each soil rated, the degree of suitability and the most restrictive features that affect the proposed use are identified. The restrictive features are identified for each moderate or severe suitability rating as it affects use and performance for the desired purpose. Thus the user can develop alternatives for use and management.

(3) These guides are designed for the management of defined classes of organic wastes and wastewater, whether or not the objective is treatment for utilization by a crop^{1/} (as with manure and food processing wastes, municipal sewage sludge, and wastewater used for irrigation); treatment without regard to crop needs (such as treatment of water by the slow process, treatment of water by the overland flow process, and treatment of water by the rapid infiltration process); or land reclamation (as with carbonaceous materials used as a soil conditioner and stabilizer). Not considered in these guides, but important in evaluating a site, are allocation and accessibility of the area, size and shape of the area, and use and management of the treatment area. Geology, hydrology, and climate are considered only to the extent that they are reflected in the kind of soil mapped. Waste quality and rate of application are considered to the extent that they are within the "safe" limits as recommended in such publications as Application of Sewage Sludge of Cropland--Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals, November 1976, MCD-33, EPA 430/9-76-013; Municipal Sludge Management--Environmental Factors, October 1977, MCA-28, EPA 430/9-77-044; Criteria for Classification of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol. 44, No. 179, September 13, 1979, pp. 53460-53464; and Process Design Manual for Land Treatment of Municipal Wastewater, October 1977, EPA 625/1-77-008, or within the regulatory guidelines adopted by the individual state(s) if the state regulation is more restrictive.

(4) This section contains guides for interpreting soils for use in the management of manure and food processing wastes; the management of municipal sewage sludge; the management of wastewater used for irrigation; the treatment of wastewater by the slow rate process; the treatment of wastewater by the overland flow process; the treatment of wastewater by the rapid infiltration process; and the management of carbonaceous material as a soil conditioner and stabilizer. Wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purpose of these guides they are not considered to be wastewater unless the water content is more limiting the to rate of application than the nutrient or biochemical oxygen demand content.

^{1/} The type of crop that can be grown and its utilization for human or animal consumption may be specified by local, state, or county health regulations.

(b) Land application of manure and food processing waste.

(1) Manure is the excrement of livestock and poultry. The consistency of manure is labile. It changes in storage or treatment, and it depends upon the bedding used and upon whether the manure is diluted or allowed to dry. Food processing wastes consist of damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. Most wastes produced in the processing of milk, cheese, and meat are liquids. Paunch manure is an exception.

(2) Manure and food processing wastes have a variable nitrogen content. The material is either solid, slurry, or liquid. A high nitrogen content limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are outside the meaning of manure and food processing wastes as used in this interpretation.

(3) As shown in the 1993 criteria table, the soil properties and qualities considered are those that affect soil absorption, plant growth, microbial activity, the susceptibility to wind or water erosion, and the rate and method of the application of wastes. Soil properties that affect absorption are permeability, the depth to a seasonal high water table, sodium adsorption ratio, the depth to bedrock or a cemented pan, and the available water capacity. Soil reaction, sodium adsorption ratio, salinity, and bulk density are soil properties that affect plant growth and microbial activity. The wind erodibility group, erosion factor, slope, and susceptibility to flooding are used to measure the potential for wind and water erosion. Stones and the depth to a seasonal high water table can interfere with the application of wastes. Permanently frozen soils are not suited to the treatment of wastes.

(4) The soil rating guide is based on utilizing the nutrients in the wastes for crop production and is not directed toward reclaiming or restoring critical areas or making the most efficient use of moisture. Applications of liquid wastes can be made by tank wagon or conventional irrigation methods that are modified as necessary to function properly. Applications of solid and slurry wastes can be made at the surface or subsurface.

7/98 rdn

The 1993 Criteria was revised to reflect the published criteria in the AGRICULTURAL WASTE MANAGEMENT FIELD HANDBOOK (Part 651), Engineering Division, Natural Resources Conservation Service, USDA. Those criteria revised are denoted with a * and the original criteria is in {}.

1993 Criteria Table: Land application of manure and food processing waste.

PROPERTY SLIGHT MODERATE SEVERE RESTRICTIVE

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Manure and Food Processing Waste**
Displayed in Report(s): MANU - Table AWM-1. Ag Waste Interp. w/fuzzy rating

FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
2. PERMEABILITY --- 2.0-6.0 >6 POOR FILTER
(0-60", IN/H)
- 2a. PERMEABILITY .2-2.0 .06-.2 <.06 PERCS SLOWLY
(0-60", IN/H) {.6-2.0} {.2-.6} {<.2}
3. DEPTH TO HIGH >4 2-4 <2 WETNESS
WATER TABLE (FT)
4. PONDING --- --- + PONDING
5. SLOPE (PCT) {<6}<8 {6}8-15 >15 SLOPE
6. DEPTH TO BEDROCK >40 20-40 <20 DEPTH TO ROCK
(IN)
7. DEPTH TO CEMENTED >40 20-40 <20 CEMENTED PAN
PAN (IN)
8. SODIUM ADSORPTION <4 4-13 >13 EXCESS SODIUM
RATIO (0-20")
9. SALINITY (SURFACE <4 4-8 >8 EXCESS SALT
LAYER, MMHOS/CM)
10. FLOODING NONE RARE OCCAS, FLOODING
FREQ
11. CLAY ACTIVITY >.15 .05-.15 <.05 LOW ADSORPTION
(CEC/CLAY)
12. STONINESS CLASS 1 2 3, 4, 5 TOO STONY
- 13a. WEIGHT PERCENT <15 15-35 >35 TOO COBBLY
3-10" (SURFACE LAYER)
- 13b. WEIGHT PERCENT <5 5-15 >15 TOO STONY
>10" (SURFACE LAYER)
14. AVAILABLE WATER >6 3-6 <3 DROUGHTY
(WEIGHT AV., 0 TO 60")
15. SOIL REACTION >6.5 3.5-6.5 <3.5 TOO ACID
(pH, SURFACE LAYER) {>6.0} {5.0-6.0} {<5.0}

Interpretation Name: **AWM - Overland Flow Process Treatment of Wastewater**
Displayed in Report(s): MANU - Table AWM-2. Ag Waste Interp. w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for surface or sprinkler application systems, waste product attenuation, plant growth, or natural decomposition processes than disposal of wastewater by OVERLAND FLOW has application, environmental or health limitations.

Part 620 - Soil Interpretations Rating Guides 620(430-VI-NSSH, 1993)

(a) General.

(1) Soil interpretations for waste management provide a means to use organic wastes and waste-water as productive resources. Using these resources will result in energy conservation, prevent waste, and minimize problems associated with their disposal. The planned use of many wastes has proven beneficial to the producer and the user of these by-products. The characteristics of the soil are important in the application of organic wastes and wastewater to land for fertilization and irrigation. They are also important considerations if the soil is used as a medium for the treatment and disposal of these wastes. Favorable soil properties are required to prevent environmental damage.

(2) The interpretation guides for wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purposes of these guides, they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand (BOD) content. The rating are for each soil in its present condition and do not consider present land use. The suitability ratings provided for each interpretation are based on the influence of existing soil properties on the use. For each soil rated, the degree of suitability and the most restrictive features that affect the proposed use are identified. The restrictive features are identified for each moderate or severe suitability rating as it affects use and performance for the desired purpose. Thus the user can develop alternatives for use and management.

(3) These guides are designed for the management of defined classes of organic wastes and wastewater, whether or not the objective is treatment

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Overland Flow Process Treatment of Wastewater**
Displayed in Report(s): MANU - Table AWM-2. Ag Waste Interp. w/fuzzy rating

for utilization by a crop^{1/} (as with manure and food processing wastes, municipal sewage sludge, and wastewater used for irrigation); treatment without regard to crop needs (such as treatment of water by the slow process, treatment of water by the overland flow process, and treatment of water by the rapid infiltration process); or land reclamation (as with carbonaceous materials used as a soil conditioner and stabilizer). Not considered in these guides, but important in evaluating a site, are allocation and accessibility of the area, size and shape of the area, and use and management of the treatment area. Geology, hydrology, and climate are considered only to the extent that they are reflected in the kind of soil mapped. Waste quality and rate of application are considered to the extent that they are within the "safe" limits as recommended in such publications as Application of Sewage Sludge of Cropland--Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals, November 1976, MCD-33, EPA 430/9-76-013; Municipal Sludge Management--Environmental Factors, October 1977, MCA-28, EPA 430/9-77-044; Criteria for Classification of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol. 44, No. 179, September 13, 1979, pp. 53460-53464; and Process Design Manual for Land Treatment of Municipal Wastewater, October 1977, EPA 625/1-77-008, or within the regulatory guidelines adopted by the individual state(s) if the state regulation is more restrictive.

(4) This section contains guides for interpreting soils for use in the management of manure and food processing wastes; the management of municipal sewage sludge; the management of wastewater used for irrigation; the treatment of wastewater by the slow rate process; the treatment of wastewater by the overland flow process; the treatment of wastewater by the rapid infiltration process; and the management of carbonaceous material as a soil conditioner and stabilizer. Wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purpose of these guides they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand content.

1/ The type of crop that can be grown and its utilization for human or animal consumption may be specified by local, state, or county health regulations.

(b) Treatment of wastewater by the overland flow process.

(1) In this process wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces which are sometimes called terraces, to runoff collection ditches. The length of the run generally is 150 to 300 feet. Application rates range from 2.5 to 16.0 inches per week. The wastewater leaves solids and nutrients to plants and soil surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost by evapotranspiration, and a small part percolates to the ground water.

(2) The wastewater considered is from municipal wastewater, food-processing plants, lagoons, and storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and possibly industrial waste. It may be, although rarely is, raw sewage (untreated), or it may be wastewater that has received primary or secondary treatment. Food-processing wastewater is the wastewater resulting from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In some places it is high in sodium and chloride. Lagoon and storage pond effluents, as discussed here, refer to the effluents from a lagoon or storage pond that is used to treat or store food-processing wastewater, domestic wastes, or animal wastes. Domestic wastes are very dilute, and the effluent from a facility that treats them commonly is very low in carbonaceous and nitrogenous matter. The nitrogen content ranges from 10 to 30 mg/l. Lagoons and storage ponds that treat animal wastes have an effluent that has a much higher concentration of these materials mainly because the manure has not been diluted as much as domestic wastes. The nitrogen content varies considerably but generally is 50 to 2,000 mg/l. The heavy metal content generally is low; however, chemical analyses should be made prior to use.

(3) As shown in 1993 Criteria Table, the soil properties and qualities considered in rating the degree of limitation are those that affect absorption, plant growth, microbial activity, and the design and construction of site. The properties that affect adsorption are soil reaction and the cation exchange capacity. Soil reaction, salinity, and the sodium adsorption ratio are soil properties that affect plant growth and microbial activity. Slope, permeability within a depth of about 30 inches, depth to a seasonal high water table, flooding, depth to bedrock or to a cemented pan, and stones are soil properties and qualities that influence design and construction. Permanently frozen soils are not suited to treating wastewater.

(4) The soil rating guide is based on the treatment of the wastewater and is not directed toward the use of the water as a source of moisture for crop production. However, areas are vegetated because plants are a necessary part of the soil-plant treatment process. Wastewater generally is applied by sprinkler or surface application methods.

1993 Criteria Table: Treatment of Wastewater by the Overland Flow Process.

LIMITS RESTRICTIVE

PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
2. SLOPE (PCT) 1-6 6-12 >12 SLOPE
- 2a. SLOPE (PCT) --- .5-1 <.5 SLOPE
3. PERMEABILITY <0.2 .2-.6 >.6 SEEPAGE
(SURFACE LAYER, IN/H)
4. DEPTH TO BEDROCK >60 40-60 <40 DEPTH TO ROCK
(IN)

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Overland Flow Process Treatment of Wastewater**
Displayed in Report(s): MANU - Table AWM-2. Ag Waste Interp. w/fuzzy rating

5. PONDING --- + PONDING
6. DEPTH TO HIGH >4 2-4 <2 WETNESS
WATER TABLE (FT)
7. FLOODING NONE RARE OCCAS, FREQ FLOODING
8. STONINESS CLASS 1 2 3, 4, 5 TOO STONY
9. WEIGHT PERCENT <15 15-35 >35 TOO COBBLY
3-10" (WEIGHTED AV. 0-40")
- 9a. WEIGHT PERCENT <5 5-15 >15 TOO STONY
>10" (WEIGHTED AV. 0-40")
10. SOIL REACTION >6.5 5.0-6.5 <5.0 TOO ACID
(pH, SURFACE LAYER)
11. DEPTH TO CEMENTED >60 40-60 <40 CEMENTED PAN
PAN (IN)
12. SODIUM ADSORPTION <4 4-13 >13 EXCESS SODIUM
RATIO (0-20")
13. SALINITY (SURFACE <8 8-16 >16 EXCESS SALT
LAYER, MMHOS/CM)
14. CLAY ACTIVITY >.15 .05-.15 <.05 LOW ADSORPTION
(CEC/CLAY)

Interpretation Name: **AWM - Rapid Infiltration Disposal of Wastewater**
Displayed in Report(s): MANU - Table AWM-2. Ag Waste Interp. w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for surface or sprinkler irrigation systems, waste product attenuation, plant growth, or natural decomposition processes than disposal of wastewater by irrigation has application, environmental or health limitations.

Part 620 - Soil Interpretations Rating Guides 620(430-VI-NSSH, 1993)

(a) General.

(1) Soil interpretations for waste management provide a means to use organic wastes and waste-water as productive resources. Using these resources will result in energy conservation, prevent waste, and minimize problems associated with their disposal. The planned use of many wastes has proven beneficial to the producer and the user of these by-products. The characteristics of the soil are important in the application of organic wastes and wastewater to land for fertilization and irrigation. They are also important considerations if the soil is used as a medium for the treatment and disposal of these wastes. Favorable soil properties are required to prevent environmental damage.

(2) The interpretation guides for wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purposes of these guides, they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand (BOD) content. The rating are for each soil in its present condition and do not consider present land use. The suitability ratings provided for each interpretation are based on the influence of existing soil properties on the use. For each soil rated, the degree of suitability and the most restrictive features that affect the proposed use are identified. The restrictive features are identified for each moderate or severe suitability rating as it affects use and performance for the desired purpose. Thus the user can develop alternatives for use and management.

(3) These guides are designed for the management of defined classes of organic wastes and wastewater, whether or not the objective is treatment for utilization by a crop/ (as with manure and food processing wastes, municipal sewage sludge, and wastewater used for irrigation); treatment without regard to crop needs (such as treatment of water by the slow process, treatment of water by the overland flow process, and treatment of water by the rapid infiltration process); or land reclamation (as with carbonaceous materials used as a soil conditioner and stabilizer). Not considered in these guides, but important in evaluating a site, are allocation and accessibility of the area, size and shape of the area, and use and management of the treatment area. Geology, hydrology, and climate are considered only to the extent that they are reflected in the kind of soil mapped. Waste quality and rate of application are considered to the extent that they are within the "safe" limits as recommended in such publications as Application of Sewage Sludge of Cropland--Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals, November 1976, MCD-33, EPA 430/9-76-013; Municipal Sludge Management--Environmental Factors, October 1977, MCA-28, EPA 430/9-77-044; Criteria for Classification of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol. 44, No. 179, September 13, 1979, pp. 53460-53464; and Process Design Manual for Land Treatment of Municipal Wastewater, October 1977, EPA 625/1-77-008, or within the regulatory guidelines adopted by the individual state(s) if the state regulation is more restrictive.

(4) This section contains guides for interpreting soils for use in the management of manure and food processing wastes; the management of

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Rapid Infiltration Disposal of Wastewater**
Displayed in Report(s): MANU - Table AWM-2. Ag Waste Interp. w/fuzzy rating

municipal sewage sludge; the management of wastewater used for irrigation; the treatment of wastewater by the slow rate process; the treatment of wastewater by the overland flow process; the treatment of wastewater by the rapid infiltration process; and the management of carbonaceous material as a soil conditioner and stabilizer. Wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purpose of these guides they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand content.

1/ The type of crop that can be grown and its utilization for human or animal consumption may be specified by local, state, or county health regulations.

(b) Treatment of wastewater by the rapid infiltration process.

(1) In this process the wastewater is applied in a level basin and percolates through the soil. The treated water eventually reaches the ground water. Application rates range from 4 to 120 inches per week.

(2) Because the thickness of soil material needed for proper renovation of the wastewater is more than 72 inches, geologic and hydrologic investigations during the planning stages are needed to ensure proper design and to determine reliability of performance as well as the potential for pollution of the ground water.

(3) The wastewater considered generally is from municipal wastewater treatment plants. The nitrogen content generally is low. Normally, the heavy metal content is low; however, chemical analysis should be made prior to use.

(4) The soil properties and qualities that influence risk of pollution, design and construction, and performance are major considerations. They are listed in Table 620-27. Depth to a seasonal high water table, flooding, and depth to bedrock or to a cemented pan present potential hazards and influence design and construction. Slope and stones are also important considerations in design and construction. The properties and qualities that influence performance are permeability and soil reaction. Permanently frozen soils are not suited to treating wastewater.

(5) The soil rating guide is based on the treatment of the wastewater and is not directed toward the use of the water as a source of moisture for crop production. Vegetation is not a necessary part of the treatment process; hence, the basins may or may not be vegetated.

1993 Criteria Table: Treatment of wastewater by the rapid infiltration process

LIMITS RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
2. SLOPE (PCT) <4 4-8 >8 SLOPE
3. PERMEABILITY >6 2.0-6.0 <2.0 PERCS SLOWLY
(0-72", IN/H)
4. PONDING --- --- + PONDING
5. DEPTH TO HIGH --- --- <6 WETNESS
WATER TABLE (FT)
6. FLOODING NONE, OCCAS FREQ FLOODING
RARE
7. DEPTH TO BEDROCK --- --- <72 DEPTH TO ROCK
(IN)
8. DEPTH TO CEMENTED --- --- <72 CEMENTED PAN
PAN (IN)
9. STONINESS CLASS 1 2 3, 4, 5 TOO STONY
10. WEIGHT PERCENT <15 15-35 >35 TOO COBBLY
3-10" (WEIGHTED AV.
TO 72")
- 10a. WEIGHT PERCENT <5 5-15 >15 TOO STONY
>10" (WEIGHTED AV.
TO 72")
11. SOIL REACTION >5 3.5-5 <3.5 TOO ACID
(pH, 10-72")

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Slow Rate Process Treatment of Wastewater**
Displayed in Report(s): MANU - Table AWM-2. Ag Waste Interp. w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for surface or sprinkler application systems, waste product attenuation, plant growth, or natural decomposition processes than disposal of wastewater by SLOW RATE has application, environmental or health limitations.

Part 620 - Soil Interpretations Rating Guides 620(430-VI-NSSH, 1993)

(a) General.

(1) Soil interpretations for waste management provide a means to use organic wastes and waste-water as productive resources. Using these resources will result in energy conservation, prevent waste, and minimize problems associated with their disposal. The planned use of many wastes has proven beneficial to the producer and the user of these by-products. The characteristics of the soil are important in the application of organic wastes and wastewater to land for fertilization and irrigation. They are also important considerations if the soil is used as a medium for the treatment and disposal of these wastes. Favorable soil properties are required to prevent environmental damage.

(2) The interpretation guides for wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purposes of these guides, they are not considered to be wastewater unless the water content is more limiting to the rate of application than the nutrient or biochemical oxygen demand (BOD) content. The rating are for each soil in its present condition and do not consider present land use. The suitability ratings provided for each interpretation are based on the influence of existing soil properties on the use. For each soil rated, the degree of suitability and the most restrictive features that affect the proposed use are identified. The restrictive features are identified for each moderate or severe suitability rating as it affects use and performance for the desired purpose. Thus the user can develop alternatives for use and management.

(3) These guides are designed for the management of defined classes of organic wastes and wastewater, whether or not the objective is treatment for utilization by a crop^{1/} (as with manure and food processing wastes, municipal sewage sludge, and wastewater used for irrigation); treatment without regard to crop needs (such as treatment of water by the slow process, treatment of water by the overland flow process, and treatment of water by the rapid infiltration process); or land reclamation (as with carbonaceous materials used as a soil conditioner and stabilizer). Not considered in these guides, but important in evaluating a site, are allocation and accessibility of the area, size and shape of the area, and use and management of the treatment area. Geology, hydrology, and climate are considered only to the extent that they are reflected in the kind of soil mapped. Waste quality and rate of application are considered to the extent that they are within the "safe" limits as recommended in such publications as Application of Sewage Sludge of Cropland--Appraisal of Potential Hazards of the Heavy Metals to Plants and Animals, November 1976, MCD-33, EPA 430/9-76-013; Municipal Sludge Management--Environmental Factors, October 1977, MCA-28, EPA 430/9-77-044; Criteria for Classification of Solid Waste Disposal Facilities and Practices, EPA, in Federal Register, Vol. 44, No. 179, September 13, 1979, pp. 53460-53464; and Process Design Manual for Land Treatment of Municipal Wastewater, October 1977, EPA 625/1-77-008, or within the regulatory guidelines adopted by the individual state(s) if the state regulation is more restrictive.

(4) This section contains guides for interpreting soils for use in the management of manure and food processing wastes; the management of municipal sewage sludge; the management of wastewater used for irrigation; the treatment of wastewater by the slow rate process; the treatment of wastewater by the overland flow process; the treatment of wastewater by the rapid infiltration process; and the management of carbonaceous material as a soil conditioner and stabilizer. Wastewater includes municipal and food processing wastewater and lagoon or storage pond effluent. Manure, food processing waste, and municipal sludge may be liquid; however, for the purpose of these guides they are not considered to be wastewater unless the water content is more limiting the to rate of application than the nutrient or biochemical oxygen demand content.

^{1/} The type of crop that can be grown and its utilization for human or animal consumption may be specified by local, state, or county health regulations.

(b) Treatment of wastewater by the slow rate process.

(1) In this process wastewater is applied to the land at a rate normally between 0.5 and 4.0 inches per week. The primary purpose is wastewater treatment rather than irrigation of crops. Application rates commonly exceed those needed for supplemental irrigation for crop production. The applied wastewater is treated as it moves through the soil. Much of the treated water percolates to the ground water, and some enters the atmosphere by evapotranspiration. Surface runoff of the applied water generally is not allowed. Waterlogging is avoided either through control of the application rate or the use of tile drains, or both.

(2) The wastewater considered includes municipal wastewater and effluent from food-processing plants, lagoons, and storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and possibly industrial waste. It may be, although rarely is, untreated sewage or may be wastewater that has received primary or secondary treatment. Food-processing wastewater is the wastewater resulting from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In some places it is high in sodium and chloride. Lagoon and storage pond effluents, as discussed here, refer to the effluents from a facility used to treat or store food-processing wastewater, domestic wastes, or animal wastes. Domestic and food-processing wastewater is very dilute, and the effluent from facilities that treat or store it commonly is very low in carbonaceous and nitrogenous matter. The nitrogen content ranges from 10 to 30 mg/l. Lagoons or storage ponds for animal wastes have an effluent that has a much higher concentration of these materials mainly because the manure has not been diluted as much as domestic wastes. The nitrogen content varies considerably but generally is 50 to 2,000 mg/l. The heavy metal content generally is low; however, chemical

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **AWM - Slow Rate Process Treatment of Wastewater**
 Displayed in Report(s): MANU - Table AWM-2. Ag Waste Interp. w/fuzzy rating

analyses should be made prior to use.

(3) As shown in 1993 Criteria Table, the soil properties and qualities considered in rating the degree of limitation are those that affect soil absorption, plant growth, microbial activity, the susceptibility to wind or water erosion, and the application of wastes. Properties and qualities that affect absorption are the sodium adsorption ratio, depth to a seasonal high water table, the available water capacity, permeability, depth to bedrock or to a cemented pan, soil reaction, cation exchange capacity, and slope. Soil reaction, the sodium adsorption ratio, salinity, and bulk density are soil properties that affect plant growth and microbial activity. Wind erodibility group, erosion factor, slope, and susceptibility to flooding are used to measure the potential for wind erosion and water erosion. Stones can interfere with the application of wastes. Permanently frozen soils are not suited to treating wastewater.

(4) The soil rating guide is based on the treatment of the wastewater and is not directed toward the use of water as a source of moisture for crop production. However, it is assumed that crops are grown or may be grown as a part of the soil-plant treatment process. Checks should be made to ensure that heavy metals and nitrogen are not added in excessive amounts.

1993 Criteria Table: Treatment of Wastewater by the Slow Rate Process.

LIMITS RESTRICTIVE
 PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
2. SODIUM ADSORPTION <4 4-13 >13 EXCESS SODIUM RATIO (0-20")
3. SALINITY (SURFACE <4 4-8 >8 EXCESS SALT LAYER, MMHOS/CM)
4. SLOPE PERCENT <3 3-8 >8 SLOPE (SURFACE)
- 4a. SLOPE PERCENT <6 6-12 >12 SLOPE (SPRINKLER)
5. PONDING --- --- + PONDING
6. DEPTH TO HIGH >4 2-4 <2 WETNESS WATER TABLE (FT)
7. PERMEABILITY 0.6-2.0 2.0-6.0 >6.0 POOR FILTER (0-60", IN/H)
- 7a. PERMEABILITY --- 0.06-0.6 <0.06 PERCS SLOWLY (0-60", IN/H)
8. DEPTH TO BEDROCK >60 40-60 <40 DEPTH TO ROCK (IN)
9. DEPTH TO CEMENTED >60 40-60 <40 CEMENTED PAN PAN (IN)
10. FLOODING NONE, RARE CCAS FREQ FLOODING
11. STONINESS CLASS 1 2 3, 4, 5 TOO STONY
12. WEIGHT PERCENT <15 15-35 >35 TOO COBBLY 3-10" (SURFACE LAYER)
13. WEIGHT PERCENT <5 5-15 >15 TOO STONY >10" (SURFACE LAYER)
14. SOIL REACTION (pH) >6.5 5.0-6.5 <5.0 TOO ACID
15. CLAY ACTIVITY >.15 .05-.15 <.05 LOW ADSORPTION (CEC/CLAY)

Interpretation Name: **ENG - Construction Materials; Gravel Source**
 Displayed in Report(s): MANU - Table ENG-1. Construction Materials w/fuzzy rating

620.06 Construction Material. Reference National Soil Survey Handbook, 1998.

(a) General.

(1) Soil survey interpretations for construction materials are made to provide guidance to users in selecting the site of a potential source. Individual

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Gravel Source**
Displayed in Report(s): MANU - Table ENG-1. Construction Materials w/fuzzy rating

soils or groups of soils may be selected as potential source materials because their source is close at hand, is the only source available, or meets some or all of the physical or chemical properties required for the intended application. In theory every soil may be used as source materials, but in reality only a few soils have the profile characteristics that meet the defined criteria and performance requirements when rated for a specific purpose. The use of rating guides can provide the user a means to select potential sites for further evaluation.

(2) As a part of the soil survey process, each soil is rated in its present condition. Suitability ratings and associated restrictive features are given for roadfill, topsoil, and soil reconstruction material. Ratings of probable and improbable sources of material are given for sand and gravel. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used. Final site evaluation and site selection require an onsite inspection to determine the suitability of the materials for the intended purpose. Implementation of these interpretations helps to minimize the need for excessive random exploratory investigation by pinpointing potential sites.

(3) Soil interpretations for construction material have a potential for broader application by the user than the name implies. The use of these interpretations in planning may include various needs directed towards urban and rural development. The interpretations may apply to farm and ranch operations; stockpiling materials for borrow pits and new mine reclamation; source material used to rehabilitate areas of soil disturbance; thin layer cover material for parking areas, roads, trails etc.; and other uses. Where the present headings for the interpretations do not meet desired application in the local area, the user may request a change to the headings. Caution should be exercised to ensure that the proposed changes are within the original intent of the original interpretation guides.

(4) Soils are rated as sources for roadfill, topsoil, sand, gravel, and soil reconstruction material used for drastically disturbed areas. Suitability ratings of good, fair, or poor and restrictive features are given for soils used as a source of roadfill and topsoil. Ratings of probable and improbable are given for soils used as a source of sand and gravel. A rating of probable means that, on the basis of the available evidence, the source material is likely to be in or below the soil. A rating of improbable means that the source material is unlikely to be in or below the soil. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used.

(d) Gravel source.

(1) Gravel as a construction material is defined as particles ranging in size from 4.76 mm (sieve #4) to 76 mm (3 inches) in diameter. Gravel is used in great quantities in many kinds of construction. Specifications for each purpose vary widely. The intent of this rating is to show only the probability of finding material in suitable quantity. The suitability of the gravel for specific purposes is not evaluated.

(2) The properties used to evaluate the soil as a probable source of gravel (Table 620-ENG 9) are grain size as indicated by the Unified soil classification, the thickness of the gravel layer, and the amount of rock fragments in the soil material. If the lowest layer of the soil contains gravel, the soil is rated as a probable source regardless of thickness. The assumption is that the gravel layer below the depth of observation exceeds the minimum thickness.

Table 620-9 Gravel Source.

LIMITS	RESTRICTIVE
PROPERTY	PROBABLE IMPROBABLE FEATURE
1. USDA TEXTURE	--- ICE PERMAFROST
2. UNIFIED (THICKEST LAYER GW, GP, GW-GM, 10-60" OR BOTTOM GP-GM LAYER)	FAVORABLE
2a. UNIFIED (THICKEST LAYER SW, SP, SW-SM, 10-60" OR BOTTOM SP-SM LAYER) 100% PASSING #4 SIEVE =>25	FAVORABLE
2b. UNIFIED (THICKEST LAYER SW, SP, SW-SM, TOO SANDY 10-60" OR BOTTOM SP-SM LAYER) 100% PASSING #4 SIEVE <25	
2c. UNIFIED PT EXCESS HUMUS	
2d. UNIFIED ALL OTHER EXCESS FINES	
3. LAYER THICKNESS >36 <36 THIN LAYER (0-72 IN)	
4. WEIGHT PERCENT >3" <50 >50 LARGE STONES (THICKEST LAYER 10-60")	

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Reclamation**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

620.06 Construction Material. (430-VI-NSSH, 1993)

(a) General.

(1) Soil survey interpretations for construction materials are made to provide guidance to users in selecting the site of a potential source. Individual soils or groups of soils may be selected as potential source materials because their source is close at hand, is the only source available, or meets some or all of the physical or chemical properties required for the intended application. In theory every soil may be used as source materials, but in reality only a few soils have the profile characteristics that meet the defined criteria and performance requirements when rated for a specific purpose. The use of rating guides can provide the user a means to select potential sites for further evaluation.

(2) As a part of the soil survey process, each soil is rated in its present condition. Suitability ratings and associated restrictive features are given for roadfill, topsoil, and soil reconstruction material. Ratings of probable and improbable sources of material are given for sand and gravel. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used. Final site evaluation and site selection require an onsite inspection to determine the suitability of the materials for the intended purpose. Implementation of these interpretations helps to minimize the need for excessive random exploratory investigation by pinpointing potential sites.

(3) Soil interpretations for construction material have a potential for broader application by the user than the name implies. The use of these interpretations in planning may include various needs directed towards urban and rural development. The interpretations may apply to farm and ranch operations; stockpiling materials for borrow pits and new mine reclamation; source material used to rehabilitate areas of soil disturbance; thin layer cover material for parking areas, roads, trails etc.; and other uses. Where the present headings for the interpretations do not meet desired application in the local area, the user may request a change to the headings. Caution should be exercised to ensure that the proposed changes are within the original intent of the original interpretation guides.

(4) Soils are rated as sources for roadfill, topsoil, sand, gravel, and soil reconstruction material used for drastically disturbed areas. Suitability ratings of good, fair, or poor and restrictive features are given for soils used as a source of roadfill and topsoil. Ratings of probable and improbable are given for soils used as a source of sand and gravel. A rating of probable means that, on the basis of the available evidence, the source material is likely to be in or below the soil. A rating of improbable means that the source material is unlikely to be in or below the soil. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used.

(f) Soil reconstruction material for drastically disturbed areas.

(1) Soil reconstruction of areas drastically disturbed, as in surface mining, is the process of replacing layers of soil material or unconsolidated geologic material, or both, in a vertical sequence of such quality and thickness that a favorable medium for plant growth is provided.

(2) Most new state strip mine programs emphasize that the land surface be restored to about its natural configuration or better and that the soil be reconstructed to maintain or improve its suitability for the intended use. Thus, a knowledge of the soil and underlying material is needed to plan proper reconstruction operations of mined land. This guide for soil reconstruction material evaluates the material as a medium for plant growth. It can be used to rate any segment of the soil profile or unconsolidated geologic material that is thick enough to warrant consideration in planned soil reconstruction. For example, for named kinds of soil, it will be necessary for most purposes to rate the A horizon, the B horizon, and the C horizon separately. If they all rate good, there may be little justification for keeping them separate for soil reconstruction. If the A horizon is rated better than the B or C, then it generally should be kept separate, depending upon its thickness and the anticipated use of the land. This guide does not cover areas of quarry, pit, dredge, and older surface mine operations that require an offsite source of soil reconstruction material. The guide "Daily Cover for Sanitary Landfill" is useful to evaluate the material used in restoration for these operations.

(3) When the soil materials are properly used in reconstruction, a rating of good means that vegetation is relatively easy to establish and maintain, that the surface is stable and resists erosion, and that the reconstructed soil has good potential productivity. Material rated fair can be vegetated and stabilized by modifying one or more properties. Topdressing with better material or applications of soil amendments may be necessary for satisfactory performance. Material rated poor has such severe problems that revegetation and stabilization are very difficult and costly. Topdressing with better material is necessary to establish and maintain vegetation.

(4) The major properties that influence erosion and stability of the surface and the productive potential of the reconstructed soil are listed in the guide, shown as Table 620-11.

(5) Excessive amounts of substances that restrict plant growth, such as sodium, salt, sulfur, copper, and nickel, create problems in establishing vegetation and, therefore, also influence erosion and the stability of the surface. Other substances, such as selenium, boron, and arsenic, enter the food chain and are toxic to animals that eat the vegetation. Of all these substances, only sodium and salt are criteria in the guide. If relatively high levels of toxic substances are in the reconstruction material, the material should be rated poor. Laboratory tests may be needed to properly identify toxic substances.

(6) Materials that are extremely acid or have the potential upon oxidation of becoming extremely acid are difficult and expensive to vegetate. They also contribute to poor water quality, in runoff or in ground water. Materials high in pyrite and marcasite without offsetting bases have high potential acidity. Laboratory tests may be needed to properly identify these materials.

(7) Vegetation is difficult to establish on soils that have high pH. Many of these soils also have a high sodium adsorption ratio, which indicates potential instability and water transmission problems.

(8) The available water capacity also is important in establishing vegetation. Soils that have a low available water capacity may require irrigation for the establishment of vegetation.

(9) The stability of the soil depends upon its erodibility by water and wind and its strength. Water erodibility is indicated by the K factor; wind erodibility is rated according to the "I" value of the wind erodibility group. Potential slippage hazard is related to soil texture, and although other factors also contribute, the ratings of soil texture represent one important factor.

(10) Soil texture also influences a number of the properties listed above, such as available water capacity and erodibility by wind or water. Texture also influences soil structure and consistence, water intake rate, runoff, fertility, workability, and trafficability.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Reclamation**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

(11) The fraction 3-10 inches is a weight percentage of rock fragments in the material used for soil reconstruction. The amount and size of rock fragments influence the ease of excavation, stockpiling, and respreading and the suitability for the final use of the land. A certain amount of rock fragments can be tolerated depending upon their size and the intended use of the reclaimed area. If the size of rock fragments exceeds 10 inches, problems are more severe.

(12) This rating guide does not cover all the soil features considered in planning soil reconstruction, such as slope, thickness of material, ease of excavation, potential slippage hazard, and soil moisture regime. The slope of the original soil may influence the method of stripping and stockpiling reconstruction material, but it may have little effect on the final contour and, therefore, on the stability and productivity of the reconstructed soil. Therefore, slope is not used as a criterion in this guide.

(13) The thickness of material suitable for reconstruction and the ease of excavation are important criteria in planning soil reconstruction operations. However, they are so dependent on the method of mining operations that they cannot be used as criteria in this guide.

(14) Soil moisture regime, climate, and weather influence the kind of vegetation to plant and the rate of revegetative growth. They are not used as criteria because the relative ranking does not change with variable moisture regimes; that is, the best soil in a moist environment is the best soil in a dry environment. Furthermore, the soil may be irrigated to establish vegetation.

Modification to the Ames criteria prior to 1996:

Layer Thickness criteria was removed for this interpretations because thickness of available material for topsoil is defined by depth to cemented pan or bedrock. If the criteria is met for all horizons above these restrictive features then that material can be excavated and layer thickness is not a contributing condition to the interpretation. rdn 2/99.

Ames criteria prior to 1996:

Table 620-11 Soil Reconstruction Material for Drastically Disturbed Areas.

LIMITS RESTRICTIVE
PROPERTY GOOD FAIR POOR FEATURE
1. SODIUM ADSORPTION <4 4-13 >13 EXCESS SODIUM
RATIO
2. SALINITY (MMHOS/CM) <8 8-16 >16 EXCESS SALT
3. SOIL REACTION 5.0-8.5 4.0-5.0 <4.0 TOO ACID
(pH, 0-40")
3a. SOIL REACTION --- <4.0 --- TOO ACID
(pH, >40")
3b. SOIL REACTION --- --- >8.5 TOO ALKALINE
4. AVAILABLE WATER >.10 .05-.10 <.05 DROUGHTY
CAPACITY (IN/IN)
5. EROSION FACTOR (K) <.35 >.35 --- ERODES EASILY
6. WIND ERODIBILITY --- --- 1, 2 SOIL BLOWING
GROUP
7. TEXTURE --- SCL, CL, C, SIC, TOO CLAYEY
SICL SC
7a. TEXTURE --- LCOS, LS, COS, S, TOO SANDY
LFS, LVFS FS, VFS
8. WEIGHT PERCENT <25 25-50 >50% TOO COBBLY
3-10"
8a. WEIGHT PERCENT >10" <5 5-15 >15 TOO STONY
9. LAYER THICKNESS (IN) >40 20-40 <20 THIN LAYER
10. ORGANIC MATTER >1 0.5-1.0 <0.5 LOW FERTILITY
(PCT)
11. CLAY ACTIVITY >.24 .16-.24 <.16 LOW FERTILITY
CEC/CLAY
12. CALCIUM CARBONATE <15 15-40 >40 EXCESS LIME
EQ (PCT)

Interpretation Name: **ENG - Construction Materials; Roadfill**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Roadfill**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

620.06 Construction Material. (430-VI-NSSH, 1993)

(a) General.

(1) Soil survey interpretations for construction materials are made to provide guidance to users in selecting the site of a potential source. Individual soils or groups of soils may be selected as potential source materials because their source is close at hand, is the only source available, or meets some or all of the physical or chemical properties required for the intended application. In theory every soil may be used as source materials, but in reality only a few soils have the profile characteristics that meet the defined criteria and performance requirements when rated for a specific purpose. The use of rating guides can provide the user a means to select potential sites for further evaluation.

(2) As a part of the soil survey process, each soil is rated in its present condition. Suitability ratings and associated restrictive features are given for roadfill, topsoil, and soil reconstruction material. Ratings of probable and improbable sources of material are given for sand and gravel. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used. Final site evaluation and site selection require an onsite inspection to determine the suitability of the materials for the intended purpose. Implementation of these interpretations helps to minimize the need for excessive random exploratory investigation by pinpointing potential sites.

(3) Soil interpretations for construction material have a potential for broader application by the user than the name implies. The use of these interpretations in planning may include various needs directed towards urban and rural development. The interpretations may apply to farm and ranch operations; stockpiling materials for borrow pits and new mine reclamation; source material used to rehabilitate areas of soil disturbance; thin layer cover material for parking areas, roads, trails etc.; and other uses. Where the present headings for the interpretations do not meet desired application in the local area, the user may request a change to the headings. Caution should be exercised to ensure that the proposed changes are within the original intent of the original interpretation guides.

(4) Soils are rated as sources for roadfill, topsoil, sand, gravel, and soil reconstruction material used for drastically disturbed areas. Suitability ratings of good, fair, or poor and restrictive features are given for soils used as a source of roadfill and topsoil. Ratings of probable and improbable are given for soils used as a source of sand and gravel. A rating of probable means that, on the basis of the available evidence, the source material is likely to be in or below the soil. A rating of improbable means that the source material is unlikely to be in or below the soil. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used.

(b) Roadfill.

(1) Roadfill consists of soil material that is excavated from its original position and used in road embankments elsewhere. The evaluations for roadfill are for low embankments that generally are less than 6 feet in height and are less exacting in design than high embankments, such as those along superhighways. The rating is given for the whole soil, from the surface to a depth of about 5 feet, based on the assumption that soil horizons will be mixed in loading, dumping, and spreading. In Table 620-7 criteria, limits, and restrictive features for rating soils for local roads and streets are given. Soils are rated as to the amount of material available for excavation, the ease of excavation, and how well the material performs after it is in place.

(2) Soil properties that affect the amount of material available for excavation are thickness of suitable material above bedrock or other material that is not suitable. The percent of coarse fragments more than 3 inches in diameter, the depth to a seasonal high water table, and the slope are properties that influence the ease of excavation. How well the soil performs in place is indicated by the AASHTO classification and group index and by the shrink-swell potential. A high content of gypsum can cause piping or pitting. Some damage to the borrow area is expected; but if revegetation and erosion control are likely to be difficult, the soil is rated severe.

Edit check 2/1999

Ames criteria prior to 1996:

Table 620-7 Roadfill.

LIMITS	RESTRICTIVE
PROPERTY	GOOD FAIR POOR FEATURE
1. USDA TEXTURE	--- --- ICE PERMAFROST
2. DEPTH TO BEDROCK (IN)	>60 40-60 <40 DEPTH TO ROCK
3. DEPTH TO CEMENTED PAN (IN)	>60 40-60 <40 CEMENTED PAN
4. SHRINK-SWELL (LE)	LOW MODERATE HIGH, SHRINK-SWELL
(THICKEST LAYER 10-60"	VERY HIGH
BEST RATING, PCT)	(<3) (3--6) (>6)
5. AASHTO GROUP INDEX	<5 5-8 >8 LOW STRENGTH
NUMBER (THICKEST LAYER 10-60"	

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Roadfill**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

BEST RATING)

6. LAYER THICKNESS (IN) >60 30-60 <30 THIN LAYER
7. WEIGHT PERCENT >3" <25 25-50 >50 LARGE STONES
(WEIGHT AV. 0-40")
8. DEPTH TO HIGH >3 1-3 <1 WETNESS
WATER TABLE (FT)
9. SLOPE (PCT) <15 15-25 >25 SLOPE

Interpretation Name: **ENG - Construction Materials; Sand Source**
Displayed in Report(s): MANU - Table ENG-1. Construction Materials w/fuzzy rating

620.06 Construction Material. Reference National Soil Survey Handbook, 1998.

(a) General.

(1) Soil survey interpretations for construction materials are made to provide guidance to users in selecting the site of a potential source. Individual soils or groups of soils may be selected as potential source materials because their source is close at hand, is the only source available, or meets some or all of the physical or chemical properties required for the intended application. In theory every soil may be used as source materials, but in reality only a few soils have the profile characteristics that meet the defined criteria and performance requirements when rated for a specific purpose. The use of rating guides can provide the user a means to select potential sites for further evaluation.

(2) As a part of the soil survey process, each soil is rated in its present condition. Suitability ratings and associated restrictive features are given for roadfill, topsoil, and soil reconstruction material. Ratings of probable and improbable sources of material are given for sand and gravel. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used. Final site evaluation and site selection require an onsite inspection to determine the suitability of the materials for the intended purpose. Implementation of these interpretations helps to minimize the need for excessive random exploratory investigation by pinpointing potential sites.

(3) Soil interpretations for construction material have a potential for broader application by the user than the name implies. The use of these interpretations in planning may include various needs directed towards urban and rural development. The interpretations may apply to farm and ranch operations; stockpiling materials for borrow pits and new mine reclamation; source material used to rehabilitate areas of soil disturbance; thin layer cover material for parking areas, roads, trails etc.; and other uses. Where the present headings for the interpretations do not meet desired application in the local area, the user may request a change to the headings. Caution should be exercised to ensure that the proposed changes are within the original intent of the original interpretation guides.

(4) Soils are rated as sources for roadfill, topsoil, sand, gravel, and soil reconstruction material used for drastically disturbed areas. Suitability ratings of good, fair, or poor and restrictive features are given for soils used as a source of roadfill and topsoil. Ratings of probable and improbable are given for soils used as a source of sand and gravel. A rating of probable means that, on the basis of the available evidence, the source material is likely to be in or below the soil. A rating of improbable means that the source material is unlikely to be in or below the soil. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used.

(c) Sand source.

Sand as a construction material is usually defined as particles ranging in size from 0.074 mm (sieve #200) to 4.75 mm (sieve #4) in diameter. Sand is used in great quantities in many kinds of construction. Specifications for each purpose vary widely. The intent of this rating is to show only the probability of finding material in suitable quantity. The suitability of the sand for specific purposes is not evaluated. The properties used to evaluate the soils as a probable source of sand are the grain size as indicated by the Unified soil classification, the thickness of the sand layer, and the amount of rock fragments in the soil material. They are listed in Table 620-ENG 8. If the lowest layer of the soil contains sand, the soil is rated as a probable source regardless of thickness. The assumption is that the sand layer below the depth of observation exceeds the minimum thickness.

Table 620-8 Sand Source.

LIMITS	RESTRICTIVE
PROPERTY	PROBABLE IMPROBABLE FEATURE
1. USDA TEXTURE	--- ICE PERMAFROST
2a. UNIFIED (THICKEST LAYER SW, SP, SW-SM, 10-60" AND LOWEST SP-SM LAYER BEST RATING)	
2b. UNIFIED (THICKEST LAYER GW, GP, GW-GM, 10-60" AND LOWEST GP-GM LAYER BEST RATING)	
% PASSING # 4 MINUS	

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Sand Source**
Displayed in Report(s): MANU - Table ENG-1. Construction Materials w/fuzzy rating

#200 SIEVE >25
2c. UNIFIED (THICKEST LAYER GW, GP, GW-GM, SMALL STONES
10-60" AND LOWEST GP-GM
LAYER BEST RATING)
% PASSING # 4 MINUS
#200 SIEVE <25
2d. UNIFIED PT EXCESS HUMUS
2e. UNIFIED ALL OTHER EXCESS FINES
3. LAYER THICKNESS (IN) >36 <36 THIN LAYER
4. WEIGHT PERCENT >3" <50 >50 LARGE STONES
(THICKEST LAYER
10-60")

Interpretation Name: **ENG - Construction Materials; Topsoil**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

620.06 Construction Material. (430-VI-NSSH, 1993)

(a) General.

(1) Soil survey interpretations for construction materials are made to provide guidance to users in selecting the site of a potential source. Individual soils or groups of soils may be selected as potential source materials because their source is close at hand, is the only source available, or meets some or all of the physical or chemical properties required for the intended application. In theory every soil may be used as source materials, but in reality only a few soils have the profile characteristics that meet the defined criteria and performance requirements when rated for a specific purpose. The use of rating guides can provide the user a means to select potential sites for further evaluation.

(2) As a part of the soil survey process, each soil is rated in its present condition. Suitability ratings and associated restrictive features are given for roadfill, topsoil, and soil reconstruction material. Ratings of probable and improbable sources of material are given for sand and gravel. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used. Final site evaluation and site selection require an onsite inspection to determine the suitability of the materials for the intended purpose. Implementation of these interpretations helps to minimize the need for excessive random exploratory investigation by pinpointing potential sites.

(3) Soil interpretations for construction material have a potential for broader application by the user than the name implies. The use of these interpretations in planning may include various needs directed towards urban and rural development. The interpretations may apply to farm and ranch operations; stockpiling materials for borrow pits and new mine reclamation; source material used to rehabilitate areas of soil disturbance; thin layer cover material for parking areas, roads, trails etc.; and other uses. Where the present headings for the interpretations do not meet desired application in the local area, the user may request a change to the headings. Caution should be exercised to ensure that the proposed changes are within the original intent of the original interpretation guides.

(4) Soils are rated as sources for roadfill, topsoil, sand, gravel, and soil reconstruction material used for drastically disturbed areas. Suitability ratings of good, fair, or poor and restrictive features are given for soils used as a source of roadfill and topsoil. Ratings of probable and improbable are given for soils used as a source of sand and gravel. A rating of probable means that, on the basis of the available evidence, the source material is likely to be in or below the soil. A rating of improbable means that the source material is unlikely to be in or below the soil. The ratings do not consider the quality of the source material because quality depends on how the source material is to be used.

(e) Topsoil.

(1) The term "topsoil" has several meanings. As used here, the term describes soil material used to cover an area so as to improve soil conditions for the establishment and maintenance of adapted vegetation.

(2) Generally, the upper part of the soil, which is richest in organic matter, is most desirable for use as topsoil; however, material excavated from deeper layers is also used. In this rating, the upper 40 inches of soil material is evaluated for use as topsoil. In the borrow area, the material below 40 inches is evaluated for its suitability for plant growth after the upper 40 inches is removed.

(3) As shown in Table 620-10, the soil properties that are used to rate the soil as topsoil are those that affect plant growth; the ease of excavation, loading, and spreading; and the reclamation of the borrow area.

(4) The physical and chemical soil properties and qualities that influence plant growth are the presence of toxic substances, soil reaction, and those properties that are inferred from the soil texture, such as the available water capacity and fertility. The properties that influence the ease of excavation, loading, and spreading are the amount of rock fragments, slope, depth to the water table, soil texture, and thickness of suitable material. The properties that influence the reclamation of the borrow area are the slope, depth to the water table, amount of rock fragments, depth to rock, and

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Topsoil**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

the presence of toxic material.

Modification to the Ames criteria prior to 1996:

Layer Thickness criteria was removed for this interpretations because thickness of available material for topsoil is defined by depth to cemented pan or bedrock. If the criteria is met for all horizons above these restrictive features then that material can be excavated and layer thickness is not a contributing condition to the interpretation. rdn 2/99.

Ames criteria prior to 1996:

Table 620-10 Topsoil.

LIMITS RESTRICTIVE
PROPERTY GOOD FAIR POOR FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
- 1a. TEXTURE (THICKEST --- LCOS, LS, COS, S, TOO SANDY LAYER 10-40") LFS, LVFS FS, VFS
- 1b. TEXTURE (THICKEST SCL, CL, --- TOO CLAYEY LAYER 0-40"), >3% SICL ORGANIC MATTER AND <35% CLAY
- 1c. TEXTURE (THICKEST --- SCL, CL, SIC, C, TOO CLAYEY LAYER 0-40") SICL SC
- 1d. TEXTURE (THICKEST --- --- FB, HM, EXCESS HUMUS LAYER 0-40") SP, MPT, MUCK, PEAT
2. DEPTH TO BEDROCK >40 20-40 <20 DEPTH TO ROCK (IN)
3. DEPTH TO CEMENTED >40 20-40 <20 CEMENTED PAN PAN (IN)
4. DEPTH TO BULK >40 20-40 <20 AREA RECLAIM DENSITY >1.8 G/CC (IN)
5. STONINESS CLASS 1 2 3,4,5 TOO STONY
6. WEIGHT PERCENT <5 5-25 >25 SMALL STONES 2mm-3" (0-40") ZONE <3" DOMINATE FRACTION
- 6a. WEIGHT PERCENT <5 5-25 >25 LARGE STONES >3" (0-40")
- 6b. WEIGHT PERCENT <25 25-50 >50 AREA RECLAIM 2mm-3" (40-72")
- 6c. WEIGHT PERCENT <15 15-30 >30 AREA RECLAIM >3" (40-72")
7. SALINITY (THICKEST <4 4-8 >8 EXCESS SALT LAYER 0-40") MMHOS/CM
8. LAYER THICKNESS (IN) >40 20-40 <20 THIN LAYER
Note: Thickness is defined by depth to cemented pan or bedrock and if the criteria is met for all horizons above these restrictive features then that material can be mixed and layer thickness is not a contributing condition to the interpretation. Therefore this criteria was not included in this version of the Topsoil interpretation. rdn 2/99.
9. DEPTH TO HIGH --- --- <1 WETNESS WATER TABLE
10. SODIUM ADSORPTION --- --- >13 EXCESS SODIUM RATIO (0-40")
11. SOIL REACTION (pH, --- --- <3.5 TOO ACID THICKEST LAYER 0-40")

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Construction Materials; Topsoil**
Displayed in Report(s): MANU - Table ENG-2. Construction Materials w/fuzzy rating

12. SLOPE (PCT) <8 8-15 >15 SLOPE
13. CALCIUM CARBONATE --- --- >40 EXCESS LIME
(PCT, 0-40")

Interpretation Name: **ENG - Daily Cover for Landfill**
Displayed in Report(s): MANU - Table ENG-6. Sanitary Facilities w/fuzzy rating

These soils are either partial or complete members of the set of soils that are limited for use as "Daily Cover for Landfill" if one or more soil properties within 150 cm (60 inches) of the soil surface are limiting.

Scope:

"Daily Cover for Landfill" interpretation is a tool for guiding the user in site selection for the safe disposal of solid waste. The interpretation is applicable to both heavily populated and sparsely populated areas. The ratings are for soils in their present condition and do not consider present land use or mechanical alterations. The use of this interpretive guide ("Daily Cover for Landfill") is important in site selection. Improper site selection, design, or installation may cause contamination of ground water and surface waters and may create health and environmental hazards. Potential hazards and limitations may be reduced or eliminated by installing systems designed to overcome or reduce the effects of the limiting soil properties.

Daily cover for landfill is the soil material that is applied daily to compacted solid waste in an area sanitary landfill. The cover material is obtained offsite, transported, and spread on the area. The required soil characteristics for both daily and final cover materials are similar enough to share one rating.

Suitability of a soil for use as cover is based on properties that reflect workability and the ease of digging and of moving and spreading the material over the refuse daily during both wet and dry periods. Soils that are loamy or silty and that are free of stones are better suited than other soils. Clayey soils may be sticky and difficult to spread, and sandy soils may be subject to soil blowing. Slope affects the ease of excavation and of moving the cover material. It also may affect the final configuration of the borrow area and, thus, runoff, erosion, and reclamation.

The soils selected for daily cover for landfill should also be suitable for growing plants. They should not contain significant amounts of substances that are toxic to plants, such as a high content of sodium, salts, or lime. They should be thick enough over bedrock, a cemented pan, or the water table so that material can be removed efficiently while leaving a borrow area that can be revegetated. However, some damage to the borrow area is expected and plant growth may not be optimum.

The interpretive rating is the maximum fuzzy membership value for the child rules that comprise the "Daily Cover for Landfill" interpretation.

Interpretation Name: **ENG - Dwellings W/O Basements**
Displayed in Report(s): MANU - Table ENG-3. Building Site Development w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for buildings without basements than buildings without basements have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.05 Building Site Development.

General.

The soil interpretations for building site development are designed to be used as a tool in evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its present condition and does not consider present land use. The limitation rating provided is based on the influence of existing soil properties for that use.

The soil feature(s) is identified for its affects on structure design and construction techniques to be used. These soil feature(s) also determines the performance to be expected after construction and the kind and degree of future maintenance required. Minor soil features are not identified or considered as part of the initial rating process but could be important factors where the major soil feature restrictions are overcome through design application.

Use of the soil interpretation rating guides in the planning and evaluation process allow the user to identify and recommend site selection and to plan alternative measures that minimize impacts on the soil resource.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Dwellings W/O Basements**
Displayed in Report(s): MANU - Table ENG-3. Building Site Development w/fuzzy rating

Dwellings without basements.

Dwellings without basements are single-family houses of three stories or less without basements. The foundation is assumed to be spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper.

Table 620-2 has rating criteria that are based on soil properties and qualities affecting the capacity of soil to support a load without movement and on those that affect excavation and construction costs. The properties and qualities affecting load-supporting capacity without movement are the presence of a high water table, flooding, and the shrink-swell behavior and compressibility of the soils. Compressibility is inferred from the Unified classification. Properties influencing the ease and amount of excavation are a seasonal high water table, slope, depth to bedrock or to a cemented pan, and the amount and size of rock fragments.

Table 620-2 Dwellings Without Basements.

LIMITS		RESTRICTIVE			
PROPERTY	SLIGHT	MODERATE	SEVERE	FEATURE	
1. USDA TEXTURE	---	---	ICE PERMAFROST		
2. TOTAL SUBSIDENCE (IN)	---	---	>12 SUBSIDES		
3. FLOODING	NONE	---	RARE, FLOODING OCCAS, FREQ		
4. PONDING	---	---	+ PONDING		
5. DEPTH TO HIGH WATER TABLE (FT)	>2.5	1.5-2.5	<1.5 WETNESS		
6. SHRINK-SWELL (LE) (THICKEST LAYER 10-40", PCT)	LOW	MODERATE	HIGH, SHRINK-SWELL VERY HIGH		
7. UNIFIED (THICKEST LAYER 10-40")	---	---	OL, OH, LOW STRENGTH	PT	
8. SLOPE (PCT)	<8	8-15	>15 SLOPE		
9. DEPTH TO HARD BEDROCK (IN)	>40	20-40	<20 DEPTH TO ROCK		
9a. DEPTH TO SOFT BEDROCK (IN)	>20	<20	---	DEPTH TO ROCK	
10. DEPTH TO CEMENTED PAN THICK (IN)	>40	20-40	<20 CEMENTED PAN		
10a. DEPTH TO CEMENTED PAN THIN (IN)	>20	<20	---	CEMENTED PAN	
11. WEIGHT PERCENT (WEIGHT AV. 0-40")	>3"	<25	25-50 >50 LARGE STONES		

Interpretation Name: **ENG - Dwellings With Basements**
Displayed in Report(s): MANU - Table ENG-3. Building Site Development w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for dwellings with basements than excavation have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.05 Building Site Development.

General.

The soil interpretations for building site development are designed to be used as a tool in evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its present condition and does not consider present land use. The limitation rating provided is based on the influence of existing soil properties for that use.

The soil feature(s) is identified for its affects on structure design and construction techniques to be used. These soil feature(s) also determines

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Dwellings With Basements**
Displayed in Report(s): MANU - Table ENG-3. Building Site Development w/fuzzy rating

the performance to be expected after construction and the kind and degree of future maintenance required. Minor soil features are not identified or considered as part of the initial rating process but could be important factors where the major soil feature restrictions are overcome through design application.

Use of the soil interpretation rating guides in the planning and evaluation process allow the user to identify and recommend site selection and to plan alternative measures that minimize impacts on the soil resource.

Dwellings with basements.

(1) Dwellings with basements are single-family houses of three stories or less with basements. The foundation is assumed to be spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet.

(2) The ratings that are based on Table 620-3 support properties and qualities that affect the capacity of a soil to bear a load without movement and those that affect excavation and construction costs. The properties affecting load supporting capacity without movement are presence of a seasonal high water table, flooding, and the shrink-swell behavior and compressibility of the soils. Compressibility is inferred from the Unified classification. Properties influencing the ease and amount of excavation are flooding, a high water table, slope, depth to bedrock or to a cemented pan, and the amount and size of coarse fragments.

Table 620-3 Dwellings With Basements.

	LIMITS	RESTRICTIVE	
PROPERTY	SLIGHT	MODERATE	SEVERE FEATURE
1. USDA TEXTURE	---	---	ICE PERMAFROST
2. TOTAL SUBSIDENCE (IN)	---	---	>12 SUBSIDES
3. FLOODING	NONE	---	RARE, FLOODING OCCAS, FREQ
4. PONDING	---	---	+ PONDING
5. DEPTH TO HIGH WATER TABLE (FT)	>6	2.5-6	<2.5 WETNESS
6. DEPTH TO HARD BEDROCK (IN)	>60	40-60	<40 DEPTH TO ROCK
6a. DEPTH TO SOFT BEDROCK (IN)	>40	20-40	<20 DEPTH TO ROCK
7. DEPTH TO CEMENTED PAN THICK (IN)	>60	40-60	<40 CEMENTED PAN
7a. DEPTH TO CEMENTED PAN THIN (IN)	>40	20-40	<20 CEMENTED PAN
8. SLOPE (PCT)	<8	8-15	>15 SLOPE
9. SHRINK-SWELL (LE) (THICKEST LAYER (<3) 10-60", PCT)	LOW	MODERATE	HIGH, VERY SHRINK-SWELL (>6) HIGH
10. UNIFIED (BOTTOM LAYER)	---	---	OL, OH, PT LOW STRENGTH
11. WEIGHT PERCENT >3" (WEIGHT AV. 0-40")	<25	25-50	>50 LARGE STONES

Interpretation Name: **ENG - Lawn, Landscape, Golf Fairway**
Displayed in Report(s): MANU - Table ENG-4. Building Site Development w/fuzzy rating
MANU - Table REC-2. Recreation w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for shallow excavations than shallow excavation have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.05 Building Site Development.

General.

The soil interpretations for building site development are designed to be used as a tool in evaluating soil suitability and identifying soil limitations

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Lawn, Landscape, Golf Fairway**
Displayed in Report(s): MANU - Table ENG-4. Building Site Development w/fuzzy rating
MANU - Table REC-2. Recreation w/fuzzy rating

for various construction purposes. As part of the interpretation process, the rating applies to each soil in its present condition and does not consider present land use. The limitation rating provided is based on the influence of existing soil properties for that use.

The soil feature(s) is identified for its affects on structure design and construction techniques to be used. These soil feature(s) also determines the performance to be expected after construction and the kind and degree of future maintenance required. Minor soil features are not identified or considered as part of the initial rating process but could be important factors where the major soil feature restrictions are overcome through design application.

Use of the soil interpretation rating guides in the planning and evaluation process allow the user to identify and recommend site selection and to plan alternative measures that minimize impacts on the soil resource.

Lawns, landscaping, and golf fairways.

The soils are rated for their use in establishing and maintaining turf for lawns and golf fairways and ornamental trees and shrubs for residential or commercial landscaping. The ratings are based on the use of soil material at the location that may have some land smoothing. Irrigation may or may not be needed and is not a criterion in rating. Traps, trees, roughs, and greens are not considered as part of the golf fairway.

The soil properties and qualities considered in rating soils for lawns, landscaping, and golf fairways include those that affect growth and trafficability after vegetation is established. They are shown in Table 620-6. The properties that affect plant growth are the content of salt, sodium, or calcium carbonate; sulfidic materials; soil reaction; depth to the water table; depth to bedrock or a cemented pan; and the available water capacity in the upper 40 inches of soil. The properties that affect trafficability after vegetation is established are flooding, wetness, slope, stoniness, and the amount of clay, sand, or organic matter in the surface layer.

Table 620-6 Lawns, Landscaping, and Golf Fairways.

LIMITS		RESTRICTIVE
PROPERTY	SLIGHT	MODERATE SEVERE FEATURE
1. USDA TEXTURE	---	ICE PERMAFROST
1a. TEXTURE	---	SIC, C, TOO CLAYEY
(SURFACE LAYER)		SC
1b. TEXTURE	---	FB, HM, EXCESS HUMUS
(SURFACE LAYER)		SP, MPT, MUCK, PEAT
1c. TEXTURE	---	LCOS, S COS TOO SANDY
(SURFACE LAYER)		
2. WEIGHT (PCT)	<25	25-50 >50 SMALL STONES
SURFACE LAYER		
2MM- 3"		
2a. WEIGHT (PCT)	<5	5-30 >30 LARGE STONES
SURFACE LAYER		>3"
3. PONDING	---	+ PONDING
4. SALINITY (MMHOS/CM)	<4	4-8 >8 EXCESS SALT
(SURFACE LAYER)		
5. SODIUM ADSORPTION	---	>12 EXCESS SODIUM
RATIO		
6. SOIL REACTION (pH)	---	<3.5 TOO ACID
7. SULFIDIC MATERIALS	---	SULFAQUENTS, EXCESS SULFUR
(GREAT GROUP)		SULFIHEMISTS
8. DEPTH TO HIGH	>2	1-2 <1 WETNESS
WATER TABLE (FT)		
9. AVAILABLE WATER	>.10	.05-.10 <.05 DROUGHTY
CAPACITY (IN/IN,		
WEIGHTED AV. OF		
MIDPOINTS TO 40")		
10. FLOODING	NONE, RARE	OCCAS FREQ FLOODING
11. SLOPE (PCT)	<8	8-15 >15 SLOPE
12. DEPTH TO BEDROCK	>40	20-40 <20 DEPTH TO ROCK
(IN)		

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Lawn, Landscape, Golf Fairway**
Displayed in Report(s): MANU - Table ENG-4. Building Site Development w/fuzzy rating
MANU - Table REC-2. Recreation w/fuzzy rating

13. DEPTH TO CEMENTED >40 20-40 <20 CEMENTED PAN
PAN (IN)
14. CALCIUM CARBONATE --- --- >40 EXCESS LIME
EQUIVALENT (PCT)
(0-40")

Interpretation Name: **ENG - Local Roads and Streets**
Displayed in Report(s): MANU - Table ENG-4. Building Site Development w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for shallow excavations than shallow excavation have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.05 Building Site Development.

General.

The soil interpretations for building site development are designed to be used as a tool in evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its present condition and does not consider present land use. The limitation rating provided is based on the influence of existing soil properties for that use.

The soil feature(s) is identified for its affects on structure design and construction techniques to be used. These soil feature(s) also determines the performance to be expected after construction and the kind and degree of future maintenance required. Minor soil features are not identified or considered as part of the initial rating process but could be important factors where the major soil feature restrictions are overcome through design application.

Use of the soil interpretation rating guides in the planning and evaluation process allow the user to identify and recommend site selection and to plan alternative measures that minimize impacts on the soil resource.

Local roads and streets.

Local roads and streets are those roads and streets that have all-weather surfacing (commonly of asphalt or concrete) and that are expected to carry automobile traffic year-round. The roads and streets consist of (1) the underlying local soil material, either cut or fill, which is called "the subgrade"; (2) the base material, which may be lime-stabilized soil, cement-stabilized soil, gravel, or crushed rock; and (3) the actual road surface or street pavement, which is either flexible (asphalt), rigid (concrete), or gravel with binder in it. They are graded to shed water, and conventional drainage measures are provided. With the probable exception of the hard surface, roads and streets are

The following lists the properties and qualities are used to rate soils for local roads and streets. The properties and qualities that affect local roads and streets are those that influence the ease of excavation and grading and the traffic-supporting capacity. The properties and qualities that affect the ease of excavation and grading are hardness of bedrock or a cemented pan, depth to bedrock or a cemented pan, depth to a water table, flooding, the amount of large stones, and slope. The properties that affect traffic-supporting capacity are soil strength as inferred from the AASHTO group index and the Unified classification, subsidence, shrink-swell behavior, potential frost action, and depth to the seasonal high water table.

LIMITS RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
2. TOTAL SUBSIDENCE (IN) --- --- >12 SUBSIDES
3. DEPTH TO HARD >40 20-40 <20 DEPTH TO ROCK
BEDROCK (IN)
- 3a. DEPTH TO SOFT >20 <20 --- DEPTH TO SOFT ROCK
BEDROCK (IN)
4. DEPTH TO CEMENTED >40 20-40 <20 CEMENTED PAN
PAN THICK (IN)
- 4a. DEPTH TO CEMENTED >20 <20 --- CEMENTED PAN
PAN THIN (IN)
5. SHRINK-SWELL (LE) LOW MODERATE HIGH, VERY SHRINK-SWELL
(THICK LAYER (<3) (3-6) (>6) HIGH

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Local Roads and Streets**
 Displayed in Report(s): MANU - Table ENG-4. Building Site Development w/fuzzy rating

- 10-40", PCT)
6. AASHTO GROUP INDEX <5 5-8 >8 LOW STRENGTH
NUMBER (THICKEST
LAYER 10-40")
 7. PONDING --- --- + PONDING
 8. DEPTH TO HIGH >2.5 1.0-2.5 <1.0 WETNESS
WATER TABLE (FT)
 9. SLOPE (PCT) <8 8-15 >15 SLOPE
 10. FLOODING NONE RARE FREQ, FLOODING
OCCAS
 11. POTENTIAL FROST LOW MODERATE HIGH FROST ACTION
ACTION
 12. WEIGHT % >3" <25 25-50 >50 LARGE STONES
(WEIGHT AV. 0-40")

Interpretation Name: **ENG - Sanitary Landfill (Area)**
 Displayed in Report(s): MANU - Table ENG-6. Sanitary Facilities w/fuzzy rating

620.08 Sanitary Facilities.

(e) Sanitary landfill (area).

(1) Sanitary landfill (area) is a method of disposing solid waste by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Properties and qualities that influence trafficability and risk of pollution are the important considerations for area sanitary landfills.

(2) In Table 620-20, the properties and qualities considered for rating soils for sanitary landfill (area) are listed. Flooding is a serious problem because of the risk of washouts and pollution downstream and the difficulty of moving trucks in and out of flooded areas.

(3) Permeability of the soil is an important consideration in all but the most arid parts of the country. If permeability is too rapid or if fractured bedrock or a fracture d cemented pan is close to the surface, the risk of contaminating the water supply by leachate is great. A high water table may also transmit pollutants to the water supply and is likely to restrict truck movement during wet seasons.

(4) Slope is a consideration because of the extra grading required to maintain roads on sloping soils. Furthermore, leachate may flow along the soil surface on sloping soils and cause difficult seepage problems in completed fills.

Table 620-20 Sanitary Landfill (Area).

LIMITS RESTRICTIVE			
PROPERTY	SLIGHT	MODERATE	SEVERE FEATURE
1. USDA TEXTURE	---	---	ICE PERMAFROST
2. FLOODING	NONE	RARE FREQ,	OCCAS FLOODING
3. DEPTH TO BEDROCK	>60	40-60	<40 DEPTH TO ROCK
(IN) (FOR NON ARIDISOLS & ARIDIC SUBGROUPS)			
4. DEPTH TO CEMENTED	>60	40-60	<40 CEMENTED PAN
PAN (IN) (FOR NON ARIDISOLS & ARIDIC SUBGROUPS)			
5. PERMEABILITY	---	---	>2.0 SEEPAGE
(IN/H, 20-40") (FOR NON ARIDISOLS & ARIDIC SUBGROUPS)			
6. PONDING	---	---	+ PONDING
7. DEPTH TO HIGH	>5	3.5-5	<3.5 WETNESS
WATER TABLE			

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Sanitary Landfill (Area)**
Displayed in Report(s): MANU - Table ENG-6. Sanitary Facilities w/fuzzy rating

APPARENT (FT)
7a. DEPTH TO HIGH >3 1.5-3 <1.5 WETNESS
WATER TABLE
PERCHED (FT)
8. SLOPE (PCT) <8 8-15 >15 SLOPE

Interpretation Name: **ENG - Sanitary Landfill (Trench)**
Displayed in Report(s): MANU - Table ENG-6. Sanitary Facilities w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for shallow excavations than shallow excavation have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.08 Sanitary Facilities.

General.

Soil interpretations for sanitary facilities are a tool for guiding the user in site selection for the safe disposal of household effluent and solid waste. The interpretation guides are applicable to both heavily populated and sparsely populated areas. The ratings are for soils in their present condition and do not consider present land use. The use of these soil interpretation guides for sanitary facilities is important in site selection to minimize the potential for pollution and health hazards in local or regional areas. Improper site selection, design, or installation may cause contamination of ground water, seepage to the soil surface, and contamination of stream systems from surface drainage or flood water. Potential contamination may be reduced or eliminated by installing systems designed to overcome or reduce

The soil properties and qualities that affect use are those that influence the ease of excavation, absorption of effluent, seepage, permeability, and suitability of soil cover material. Many soil survey areas in sparsely populated parts of the country have only soil surveys of lower intensity. While some general observations may be made, ons

Soil limitation ratings and associated restrictive features are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings and restrictive features are given f

Farm and ranch homesteads, outbuildings, and recreational facilities require a means to safely dispose of effluent and solid waste. A plan that includes daily cover for landfill and added protection to reduce offsite pollution minimizes the potential hazard. The interpretative guide for the use of daily cover for landfill also has additional application for the reclamation of some quarries, pits, and surface mine operations. The use of this guide should also include an evaluation of the material used in restoration of the target areas for the final establishment of vegetative cov

Soil properties are important in selecting sites for septic tank absorption fields, sewage lagoons, and sanitary landfills and in identifying the limiting soil properties and site features that should considered in planning, design, and installation. The soil properties that determine the ease of excavation or the installation of the facilities also affect the ratings. Soil limitation ratings of slight, moderate, or severe are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of good, fair, and poor are given

Sanitary landfill (trench).

Sanitary landfill (trench) is a method of disposing solid waste by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill.

Ratings are based on properties and qualities to the depth normally observed during soil mapping (approximately 5 or 6 feet). However, because trenches may be as deep as 15 feet or more, geologic investigations are needed to determine the potential for pollution of ground water as well as to determine the design needed. These investigations, which are generally arranged by the landfill developer, include the examination of stratification, rock formations, and geologic conditions that might lead to the conducting of leachates to aquifers, wells, water courses, and other water sources. The presence of hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or immediately underlying the proposed trench bottom is undesirable because of the difficulty in excavation and the potential pollution of underground water.

Soil properties and qualities used in ratings for sanitary landfill (trench) are listed in Table 620-19. Properties that influence the risk of pollution, ease of excavation, trafficability, and revegetation are major considerations. Soils that flood or have a water table within the depth of excavation present a potential pollution hazard and are difficult to excavate.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Sanitary Landfill (Trench)**
Displayed in Report(s): MANU - Table ENG-6. Sanitary Facilities w/fuzzy rating

Slope is an important consideration because it affects the work involved in road construction, the performance of the roads, and the control of surface water around the landfill. It may also cause difficulty in constructing trenches for which the trench bottom must be kept level and oriented to follow the contour.

The ease with which the trench is dug and with which a soil can be used as daily and final cover is based largely on texture and consistence of the soil. The texture and consistence of a soil determine the degree of workability of the soil both when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and difficult to place as a uniformly thick cover over a layer of refuse.

The uppermost part of the final cover should be soil material that is favorable for the growth of plants. It should not contain excess sodium or salt and should not be too acid. In comparison with other horizons, the A horizon in most soils has the best workability and the highest content of organic matter. Thus, for a trench-type landfill operation it may be desirable to stockpile the surface layer for use in the final blanketing of the fill.

Table 620-19 Sanitary Landfill (Trench).

NOTE: THE LOWER CRITERIA FOR COARSE FRAGMENTS WAS REVISED TO SYNCHRONIZE WITH OTHER SIMILAR INTERPRETATIONS. THE FOLLOWING CHANGE WAS MADE ON 4.99.

LIMITS RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE
WEIGHT PERCENT >3" <15 20-35 >35 LARGE STONES
(WEIGHTED AV. TO 72")

Ames prior to 1996.

1. FLOODING NONE RARE FREQ, OCCAS FLOODING
2. DEPTH TO BEDROCK --- --- <72 DEPTH TO ROCK
HARD (IN)
- 2a. DEPTH TO BEDROCK --- --- <72 DEPTH TO ROCK
SOFT (IN)
3. DEPTH TO CEMENTED --- <72 --- CEMENTED PAN
PAN THICK (IN)
- 3a. DEPTH TO CEMENTED --- --- <72 CEMENTED PAN
PAN THIN (IN)
4. PERMEABILITY --- --- >2.0 SEEPAGE
(IN/H, BOTTOM LAYER)
- 4a. PERMEABILITY ANY ENTRY --- SEEPAGE
(IN/H, BOTTOM LAYER; IF ARIDISOL
AND NOT SALORTHID OR AQUIC
SUBGROUPS, ALL ARIDIC SUBGROUPS,
ALL TORRIC GREAT GROUPS EXCEPT
AQUIC SUBGROUPS)
5. PONDING --- --- + PONDING
6. DEPTH TO APPARENT HIGH --- --- <6 WETNESS
WATER TABLE (FT)
- 6a. DEPTH TO PERCHED HIGH >4 2-4 <2 WETNESS
WATER TABLE (FT)
7. SLOPE PERCENT <8 8-15 >15 SLOPE
8. USDA TEXTURE --- --- ICE PERMAFROST
- 8a. TEXTURE (THICKEST --- CL, SC, SIC, C TOO CLAYEY
LAYER 10-72"; SICL
FOR NON ARIDISOL, ARID
SUBGROUPS, &
TOR GREAT GROUPS)
- 8b. TEXTURE (THICKEST --- SIC, C --- TOO CLAYEY
LAYER 10-72"
KAOLINITIC MIN.)
- 8c. TEXTURE (THICKEST --- LCOS, LS, COS, S, TOO SANDY
LAYER 10-72") LFS, LVFS FS, VFS,
SG
9. UNIFIED (THICKEST --- --- OL, OH, EXCESS HUMUS
LAYER 10-72") PT
10. WEIGHT PERCENT >3" <20 20-35 >35 LARGE STONES

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Sanitary Landfill (Trench)**
Displayed in Report(s): MANU - Table ENG-6. Sanitary Facilities w/fuzzy rating

(WEIGHTED AV. TO 72")

11. SODIUM ADSORPTION --- --- >13 EXCESS SODIUM
RATIO (NON ARIDISOLS,
ARIDIC, AND TORRIC SUBGROUPS
12. SOIL REACTION (pH, --- --- <3.5 TOO ACID
ANY DEPTH)
13. SALINITY (MMHOS/CM, --- --- >16 EXCESS SALT
ANY DEPTH)

Interpretation Name: **ENG - Septic Tank Absorption Fields**
Displayed in Report(s): MANU - Table ENG-5. Sanitary Facilities w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for shallow excavations than shallow excavation have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides 620(430-VI-NSSH, 1993)

(a) General.

(1) Soil interpretations for sanitary facilities are a tool for guiding the user in site selection for the safe disposal of household effluent and solid waste. The interpretation guides are applicable to both heavily populated and sparsely populated areas. The ratings are for soils in their present condition and do not consider present land use. The use of these soil interpretation guides for sanitary facilities is important in site selection to minimize the potential for pollution and health hazards in local or regional areas. Improper site selection, design, or installation may cause contamination of ground water, seepage to the soil surface, and contamination of stream systems from surface drainage or flood water. Potential contamination may be reduced or eliminated by installing systems designed to overcome or reduce the effects of the limiting soil property.

(2) The soil properties and qualities that affect use are those that influence the ease of excavation, absorption of effluent, seepage, permeability, and suitability of soil cover material. Many soil survey areas in sparsely populated parts of the country have only soil surveys of lower intensity. While some general observations may be made, onsite evaluation is required before the final site is selected.

(3) Soil limitation ratings and associated restrictive features are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings and restrictive features are given for daily cover for landfill.

(4) Farm and ranch homesteads, outbuildings, and recreational facilities require a means to safely dispose of effluent and solid waste. A plan that includes daily cover for landfill and added protection to reduce offsite pollution minimizes the potential hazard. The interpretative guide for the use of daily cover for landfill also has additional application for the reclamation of some quarries, pits, and surface mine operations. The use of this guide should also include an evaluation of the material used in restoration of the target areas for the final establishment of vegetative cover.

(5) Soil properties are important in selecting sites for septic tank absorption fields, sewage lagoons, and sanitary landfills and in identifying the limiting soil properties and site features that should be considered in planning, design, and installation. The soil properties that determine the ease of excavation or the installation of the facilities also affect the ratings. Soil limitation ratings of slight, moderate, or severe are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of good, fair, and poor are given for daily cover for landfill.

(b) Septic tank absorption fields.

(1) Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. The centerline depth of the tile is assumed to be 24 inches. Only the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

(2) As shown in Table 620-17, the soil properties and qualities that affect the absorption of the effluent are permeability, depth to a seasonal high water table, depth to bedrock, depth to a cemented pan, and susceptibility to flooding. Stones and boulders and a shallow depth to bedrock, ice, or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas. Also, soil erosion is a hazard where absorption fields are installed in sloping soils.

(3) Some soils are underlain by loose sand and gravel or fractured bedrock at a depth less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new; as a result, the ground water supply may be contaminated. Soils that have a hazard of inadequate filtration are given a severe rating.

(4) Percolation tests are used by some regulatory agencies to evaluate the suitability of a soil for septic tank absorption fields. These tests should

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Septic Tank Absorption Fields**
Displayed in Report(s): MANU - Table ENG-5. Sanitary Facilities w/fuzzy rating

be performed during the season when the water table is highest and the soil is at minimum absorptive capacity. The percolation rates do not correspond to the permeability rates because they are measured by different methods. Experience indicates that soils that have a percolation rate faster than 45 minutes per inch function satisfactorily, soils that have a rate between 45 and 60 minutes per inch have moderate limitations, and soils that have a rate slower than 60 minutes per inch have severe limitations.1/

(5) In many of the soils that have moderate or severe limitations for septic tank absorption fields, it may be possible to install special systems that lower the seasonal water table or to increase the size of the absorption field so that satisfactory performance is achieved.2/ However, such systems are not considered in this guide.

1/ U.S. Department of Health, Education and Welfare, Public Health Service, 1969 Manual of Septic Tanks, PHS Publication No. 526, p. 8.

2/ Bouma, J. 1974. New Concepts in Soil Survey Interpretations for Onsite Disposal of Septic Tank Effluent.

Table 620-17 Septic Tank Absorption Fields.
Prior to October, 1996

LIMITS RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
2. TOTAL SUBSIDENCE (IN) --- --- >24 SUBSIDES
3. FLOODING NONE RARE FREQ, FLOODING
OCCAS
4. DEPTH TO BEDROCK (IN) >72 40-72 <40 DEPTH TO ROCK
5. DEPTH TO >72 40-72 <40 CEMENTED PAN
CEMENTED PAN (IN)
6. PONDING --- --- + PONDING
7. DEPTH TO HIGH >6 4-6 <4 WETNESS
WATER TABLE (FT)
8. PERMEABILITY 2.0-6.0 0.6-2.0 <0.6 PERCS SLOWLY
(24-60", IN/H)
- 8a. PERMEABILITY --- --- >6.0 POOR FILTER
(24-60", IN/H)
9. SLOPE (PCT) <8 8-15 >15 SLOPE
10. WEIGHT PERCENT <25 25-50 >50 LARGE STONES
>3" (WEIGHTED AV. TO 40")

Interpretation Name: **ENG - Sewage Lagoons**
Displayed in Report(s): MANU - Table ENG-5. Sanitary Facilities w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for shallow excavations than shallow excavation have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.08 Sanitary Facilities.

General.

Soil interpretations for sanitary facilities are a tool for guiding the user in site selection for the safe disposal of household effluent and solid waste. The interpretation guides are applicable to both heavily populated and sparsely populated areas. The ratings are for soils in their present condition and do not consider present land use. The use of these soil interpretation guides for sanitary facilities is important in site selection to minimize the potential for pollution and health hazards in local or regional areas. Improper site selection, design, or installation may cause contamination of ground water, seepage to the soil surface, and contamination of stream systems from surface drainage or flood water. Potential contamination may be reduced or eliminated by installing systems designed to overcome or reduce

The soil properties and qualities that affect use are those that influence the ease of excavation, absorption of effluent, seepage, permeability, and suitability of soil cover material. Many soil survey areas in sparsely populated parts of the country have only soil surveys of lower intensity. While some general observations may be made, ons

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Sewage Lagoons**
Displayed in Report(s): MANU - Table ENG-5. Sanitary Facilities w/fuzzy rating

Soil limitation ratings and associated restrictive features are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings and restrictive features are given for

Farm and ranch homesteads, outbuildings, and recreational facilities require a means to safely dispose of effluent and solid waste. A plan that includes daily cover for landfill and added protection to reduce offsite pollution minimizes the potential hazard. The interpretative guide for the use of daily cover for landfill also has additional application for the reclamation of some quarries, pits, and surface mine operations. The use of this guide should also include an evaluation of the material used in restoration of the target areas for the final establishment of vegetative cover

Soil properties are important in selecting sites for septic tank absorption fields, sewage lagoons, and sanitary landfills and in identifying the limiting soil properties and site features that should be considered in planning, design, and installation. The soil properties that determine the ease of excavation or the installation of the facilities also affect the ratings. Soil limitation ratings of slight, moderate, or severe are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of good, fair, and poor are given

Sewage lagoons.

(1) Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the wastes. Lagoons have a nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Relatively impervious soil for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

(2) The properties, qualities, limits, and restrictive features used in rating soils for sewage lagoons are listed in Table 620-18. Soil permeability is a critical property in evaluating a soil for sewage lagoons. Most porous soils will eventually seal when being used for a sewage lagoon. Until they do, however, the hazard of pollution is severe. Soils that have a permeability rate that exceeds 2 inches per hour generally are too porous for the proper operation of sewage lagoons and may cause contamination. Fractured bedrock within a depth of 40 inches may create a pollution hazard. Bedrock and cemented pans create construction problems.

(3) Slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make smoothing practical so that the lagoon is uniformly deep throughout.

(4) If floodwater overtops the lagoon, it interferes with the functioning of the lagoon and carries away polluting sewage before sufficient decomposition has taken place. Ordinarily, soils susceptible to flooding have a severe limitation for sewage lagoons. If floodwater velocities are slow and flooding is rarely deep enough to overtop the lagoon

(5) Soils that contain a large amount of organic matter are not suitable for the floor of an aerobic lagoon

(6) Depth to water table is important if it influences the water level in the lagoon. If it does, a pollution hazard exists. Sometimes depth to water table is disregarded if the lagoon floor is of slowly permeable soil material that is at least 4 feet thick. Soils that contain excess rock fragments greater than 3 inches are undesirable sites for

LIMITS RESTRICTIVE

- | PROPERTY | SLIGHT | MODERATE | SEVERE | FEATURE |
|--------------------|---------------|----------|--------|-------------------------|
| 1. USDA TEXTURE | --- | --- | --- | ICE PERMAFROST |
| 2. PERMEABILITY | <0.6 | 0.6-2.0 | >2.0 | SEEPAGE |
| | (IN/H) | (12-60") | | |
| 3. DEPTH TO HARD | >60 | 40-60 | <40 | DEPTH TO ROCK |
| | | | | BEDROCK (IN) |
| 3a. DEPTH TO SOFT | >60 | 40-60 | <40 | DEPTH TO ROCK |
| | | | | BEDROCK (IN) |
| 4. DEPTH TO | >60 | 40-60 | <40 | CEMENTED PAN |
| | | | | CEMENTED PAN (IN) |
| 5. FLOODING (HIGH | NONE | --- | OCCAS | FLOODING |
| VELOCITY OR RARE | FREQ | | | |
| | >5 FEET HIGH) | | | |
| 6. SLOPE (PCT) | <2 | 2-7 | >7 | SLOPE |
| 7. UNIFIED | --- | OL, OH | PT | EXCESS HUMUS |
| | (ANY DEPTH) | | | |
| 8. PONDING | --- | --- | + | PONDING |
| 9. DEPTH TO HIGH | >5 | 3.5-5 | <3.5 | WETNESS |
| | | | | WATER TABLE (FT) |
| | | | | (IF NO LAYER >20" THICK |
| | | | | WITH PERM. <.2"/H) |
| 10. WEIGHT PERCENT | <20 | 20-35 | >35 | LARGE STONES |

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Sewage Lagoons**
Displayed in Report(s): MANU - Table ENG-5. Sanitary Facilities w/fuzzy rating

>3" (WEIGHTED AV. TO 20")

Interpretation Name: **ENG - Shallow Excavations**
Displayed in Report(s): MANU - Table ENG-4. Building Site Development w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for shallow excavations than shallow excavation have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.05 Building Site Development.

General.

The soil interpretations for building site development are designed to be used as a tool in evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its present condition and does not consider present land use. The limitation rating provided is based on the influence of existing soil properties for that use.

The soil feature(s) is identified for its affects on structure design and construction techniques to be used. These soil feature(s) also determines the performance to be expected after construction and the kind and degree of future maintenance required. Minor soil features are not identified or considered as part of the initial rating process but could be important factors where the major soil feature restrictions are overcome through design application.

Use of the soil interpretation rating guides in the planning and evaluation process allow the user to identify and recommend site selection and to plan alternative measures that minimize impacts on the soil resource.

Shallow excavations.

Shallow excavations are trenches or holes dug in the soil to a maximum depth of 5 or 6 feet. They are used for pipelines, sewer lines, telephone and power transmission lines, basements, open ditches, grave sites, etc. The excavations are most commonly made by trenching machines or backhoes.

Table 620-1 displays the soil properties and qualities, limits, and restrictive features used in rating soils for shallow excavations. The ratings are based on the soil properties that influence ease of digging and resistance to sloughing. Depth to bedrock or cemented pan, hardness of bedrock or a cemented pan, and the amount of large stones influence the ease of digging, filling, and compacting. Depth to the seasonal high water table and flooding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture and depth to water table influence the resistance to sloughing.

Table 620-1 Shallow Excavations.

	LIMITS	RESTRICTIVE
PROPERTY	SLIGHT	MODERATE SEVERE FEATURE
1. DEPTH TO HARD BEDROCK (IN)	>60	40-60 <40 DEPTH TO ROCK
1a. DEPTH TO SOFT BEDROCK (IN)	>40	20-40 <20 DEPTH TO ROCK
2. DEPTH TO CEMENTED PAN THICK (IN)	>60	40-60 <40 CEMENTED PAN
2a. DEPTH TO CEMENTED PAN THIN (IN)	>40	20-40 <20 CEMENTED PAN
3. USDA TEXTURE	---	ICE PERMAFROST
3a. TEXTURE (20-60")	---	SI (IF NOT COS, S, CUTBANKS CAVE LOESS) FS, VFS, LCOS, LS, LVFS, G
3b. TEXTURE (20-60")	---	SIC, C --- TOO CLAYEY (IF NOT OXIC SUBGROUP, KANDI GREAT GROUP, OXISOL, KANDHAPL OR

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Shallow Excavations**
Displayed in Report(s): MANU - Table ENG-4. Building Site Development w/fuzzy rating

- KAOLINITIC MINERALOGY)
4. SOIL ORDER UNIFIED --- --- VERTISOL CUTBANKS CAVE
 5. UNIFIED (20-60") --- --- OL, OH, PT EXCESS HUMUS
 6. WEIGHT PERCENT <25 25-50 >50 LARGE STONES
>3" (WEIGHTED AV. TO 40")
 7. PONDING --- --- + PONDING
 8. DEPTH TO HIGH >6 2.5-6 <2.5 WETNESS
WATER TABLE (FT)
 9. FLOODING NONE, RARE OCCAS, FREQ FLOODING
 10. SLOPE (PCT) <8 8-15 >15 SLOPE
 11. BULK DENSITY --- >1.8 --- DENSE LAYER
(G/CC) (20-60")

Interpretation Name: **ENG - Small Commercial Buildings**
Displayed in Report(s): MANU - Table ENG-3. Building Site Development w/fuzzy rating

If soil properties within 150 cm (60 in) of the surface of the soil are limitations for buildings without basements than buildings without basements have construction and performance limitations.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.05 Building Site Development.

General.

The soil interpretations for building site development are designed to be used as a tool in evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its present condition and does not consider present land use. The limitation rating provided is based on the influence of existing soil properties for that use.

The soil feature(s) is identified for its affects on structure design and construction techniques to be used. These soil feature(s) also determines the performance to be expected after construction and the kind and degree of future maintenance required. Minor soil features are not identified or considered as part of the initial rating process but could be important factors where the major soil feature restrictions are overcome through design application.

Use of the soil interpretation rating guides in the planning and evaluation process allow the user to identify and recommend site selection and to plan alternative measures that minimize impacts on the soil resource.

Small commercial buildings.

(1) Small commercial buildings are those buildings that are less than three stories without basements. The foundation is assumed to be spread footings of reinforced concrete at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper.

(2) Table 620-4 lists the properties and qualities used in rating undisturbed soils. The ratings are based on properties and qualities affecting the capacity of the soil to support a load without movement and those that affect excavation and construction costs. The properties and qualities affecting load-supporting capacity without movement are presence of a high water table, flooding, and the shrink-swell behavior and compressibility of the soils. Compressibility is inferred from the Unified classification. Properties influencing the ease and amount of excavation are flooding, a high water table, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cement

LIMITS RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
2. TOTAL SUBSIDENCE --- --- >12 SUBSIDES
3. FLOODING NONE --- RARE, FLOODING
OCCAS, FREQ
4. PONDING --- --- + PONDING
5. DEPTH TO HIGH >2.5 1.5-2.5 <1.5 WETNESS

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **ENG - Small Commercial Buildings**
Displayed in Report(s): MANU - Table ENG-3. Building Site Development w/fuzzy rating

- WATER TABLE (FT)
6. SHRINK-SWELL (LE) LOW MODERATE HIGH, VERY SHRINK-SWELL
(THICKEST LAYER (<3) (3-6) (>6) HIGH
10-40", PCT)
7. SLOPE (PCT) <4 4-8 >8 SLOPE
8. UNIFIED (THICKEST --- --- OL, OH, PT LOW STRENGTH
LAYER 10-40")
9. DEPTH TO HARD >40 20-40 <20 DEPTH TO ROCK
BEDROCK (IN)
- 9a. DEPTH TO SOFT >20 <20 --- DEPTH TO SOFT ROCK
BEDROCK (IN)
10. DEPTH TO >40 20-40 <20 CEMENTED PAN
CEMENTED PAN THICK (IN)
- 10a. DEPTH TO >20 <20 --- CEMENTED PAN
CEMENTED PAN THIN (IN)
11. WEIGHT <25 25-50 >50 LARGE STONES
PERCENT >3" (WEIGHT AV. 0-40")

Interpretation Name: **FOR - Construction Limitations for Haul Roads/Log Landings**
Displayed in Report(s): MANU - Table FOR-1. Forestland Management w/fuzzy rating

FOR - CONSTRUCTION LIMITATIONS FOR HAUL ROADS/LOG LANDINGS

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

Ratings reflect limitations for constructing haul roads and log landings.

Ratings assess:

- * Earth moving activities to meet standards and specifications for haul roads and log landings.
- * Excavating, removal and shaping of native soil materials to develop haul roads and log landings for forest harvesting and other management activities.
- * Cuts and fills less than 10 feet in depth.
- * The use of bladed crawler tractors, excavators, graders and other primary construction equipment.
- * Year-round water tables, year-round ponding and permafrost.
- * Frequency and duration of flooding.

Ratings assume:

- * Construction activities occur during customary periods of such work for the local area.
- * Roads are up to one mile in length with up to a 20-foot running surface.

Ratings do no assess:

- * Snow-covered soils.

Rating Classes (Crisp):

- * Slight - Little or no limitations to construction activities.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Construction Limitations for Haul Roads/Log Landings**
Displayed in Report(s): MANU - Table FOR-1. Forestland Management w/fuzzy rating

** Moderate - One or more limitations that cause some difficulty.*

** Severe - One or more limitations that make road or log landing construction very difficult or more costly.*

Interpretation Name: **FOR - Hand Planting Suitability**
Displayed in Report(s): MANU - Table FOR-3. Forestland Management w/fuzzy rating

FOR - HAND PLANTING SUITABILITY

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

** Ratings indicate the expected difficulty of hand planting.*

Ratings assess:

** Activities that include the proper placement of the root systems of tree and shrub seedlings to a depth of up to 12.*

** The use of bareroot stock, tublings, containerized stock and cuttings.*

** The use of spades, dibbles, planting bars or other similar planting tools.*

** Year-round water tables and year-round ponding.*

Ratings assume:

** Necessary site preparation is completed before hand planting.*

** Planting activities occur during customary periods of such work for the local area.*

Ratings do not assess:

** Non-soil obstacles, e.g., slash.*

** Human-held powered equipment such as power augers.*

** Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).*

** Frozen or snow-covered soils.*

Rating Classes (Crisp):

** Well Suited - Little or no restrictions to hand planting; planting rates are not affected.*

** Moderately Suited - One or more restrictions that impede planting and reduce planting rates.*

** Poorly suited - One or more restrictions that severely impede planting and reduce planting.*

** Unsited - Site factors and features prevent the proper planting of seedlings.*

Interpretation Name: **FOR - Harvest Equipment Operability**
Displayed in Report(s): MANU - Table FOR-3. Forestland Management w/fuzzy rating

FOR - HARVEST EQUIPMENT OPERABILITY

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Harvest Equipment Operability**
Displayed in Report(s): MANU - Table FOR-3. Forestland Management w/fuzzy rating

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

The suitability for operating harvesting equipment.

Ratings assess:

- * The off-road transport or harvest of logs and/or wood products by ground-based wheeled or tracked equipment.*
- * The use of standard rubber-tire skidders and bulldozers used for ground-based harvesting and transport.*
- * Activities that disturb from 35 to 75 percent of the surface area with rutting, puddling or displacement up to a depth of 18.*
- * Year-round water tables and year-round ponding.*

Ratings assume:

- * Activities occur during customary periods of such work for the local area.*

Ratings do not assess:

- * Non-soil obstacles, e.g., slash.*
- * Frozen or snow-covered soils.*

Rating Classes (Crisp):

- * Well Suited- Little or no restrictions to equipment operability.*
- * Moderately Suited - One or more restrictions reduce the effective and safe use of equipment.*
- * Poorly suited - One or more restrictions make the use of equipment impractical or unsafe.*

Interpretation Name: **FOR - Log Landing Suitability**
Displayed in Report(s): MANU - Table FOR-1. Forestland Management w/fuzzy rating

FOR - LOG LANDING SUITABILITY

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

The suitability of the soil at the forest site to serve as a log landing.

Ratings assess:

- * Efficient and effective use of equipment for the temporary storage and handling of logs.*
- * The use of grapple hooks, skidders, trucks, loaders, cable yarders and other similar equipment.*
- * Activities that disturb 100 percent of the soil surface area with rutting, puddling or displacement up to a depth of 18.*
- * The landscape in its natural setting.*
- * Frequency and duration of flooding, ponding and depth and duration of water table.*

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Log Landing Suitability**
Displayed in Report(s): MANU - Table FOR-1. Forestland Management w/fuzzy rating

Ratings assume:

* *Vegetation and debris is cleared from an area sufficient in size for the road or landing before use begins.*

Ratings do not assess:

* *Non-soil obstacles, e.g., slash.*

* *Frozen or snow-covered soil.*

Rating Classes (Crisp):

* *Suited - Little or no restrictions to road or log landing suitability.*

* *Moderately Suited - One or more restrictions reduce site suitability.*

* *Poorly suited - One or more restrictions generally make the use of the site for a landing very difficult or unsafe.*

Interpretation Name: **FOR - Mechanical Planting Suitability**
Displayed in Report(s): MANU - Table FOR-3. Forestland Management w/fuzzy rating

FOR - MECHANICAL PLANTING SUITABILITY

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

* *The difficulty of planting trees or shrubs using a mechanical planter.*

Ratings assess:

* *Activities that include the proper placement of the root systems of tree and shrub seedlings to a depth of up to 12.*

* *The use of bareroot stock, tublings, containerized stock and cuttings.*

* *Year-round water tables and year-round ponding.*

* *The use of mechanical planters that create narrow furrows or trenches to a depth of 12 and are operated on the contour or cross-slope.*

* *The use of mechanical planters on a 3-point hitch with coulter, shank or trench shoe and packing wheel pulled by sufficiently powered equipment.*

Ratings assume:

* *Planting activities occur during customary periods of such work for the local area.*

* *Necessary site preparation is completed before mechanical planting.*

Ratings do not assess:

* *Non-soil obstacles, e.g., slash.*

* *Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).*

* *Frozen or snow-covered soils.*

Rating Classes (Crisp):

* *Well Suited - Little or no restrictions to mechanical planting; planting rates are not affected.*

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Mechanical Planting Suitability**
Displayed in Report(s): MANU - Table FOR-3. Forestland Management w/fuzzy rating

** Moderately Suited - One or more restrictions that impede planting and reduce planting rates.*

** Poorly Suited - One or more restrictions that severely impede planting and reduce planting rates.*

** Unsited - Site factors and features prevent mechanical planting of seedlings.*

Interpretation Name: **FOR - Mechanical Site Preparation (Deep)**
Displayed in Report(s): MANU - Table FOR-4. Forestland Management w/fuzzy rating

FOR - MECHANICAL SITE PREPARATION (DEEP)

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

** Ratings indicate the suitability of using deep soil tillage equipment.*

Ratings assess:

** Activities that include subsoiling, ripping and other subsurface soil disturbance across the slope.*

** Activities that treat up to 50 to 75 percent of the site to 36 in depth to break up restrictive or compacted layers and increase infiltration for plant growth.*

** Features and characteristics from the surface to 36 in depth.*

The use of rippers, subsoilers and other implements pulled by bulldozers (D8 or equivalent) that till at a depth greater than 12.

** Year-round water tables and year-round ponding.*

Ratings assume:

** Activities occur during customary periods of such work for the local area.*

Ratings do not assess:

** Non-soil obstacles, e.g., slash.*

** Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).*

** Frozen or snow-covered soils.*

Rating Classes (Crisp):

** Suited - Little or no restrictions to deep mechanical site preparation.*

** Poorly Suited - One or more restrictions reduce the effective and safe use of equipment.*

** Unsited - One or more restrictions generally prevent a sufficient level of deep mechanical site preparation.*

Interpretation Name: **FOR - Mechanical Site Preparation (Surface)**
Displayed in Report(s): MANU - Table FOR-4. Forestland Management w/fuzzy rating

FOR - MECHANICAL SITE PREPARATION (SURFACE)

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Mechanical Site Preparation (Surface)**
Displayed in Report(s): MANU - Table FOR-4. Forestland Management w/fuzzy rating

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

Ratings indicate the suitability of using surface-altering soil tillage equipment.

Ratings Assess:

- * Activities that include modifying the soil surface to prepare the site for planting or seeding.*
- * Activities that treat up to 50 to 75 percent of the site to 12 in depth. Features and characteristics from the surface to 12 in depth. The use of brush rakes, chisels, disks and other similar types of implements pulled by bulldozers or tractors (D6/D7, 150 h.p. tractor or equivalent).*
- * Year-round water tables and year-round ponding.*

Ratings Assume:

- * Activities for such work occur during customary periods for the local area.*

Ratings do not assess:

- * Non-soil obstacles, e.g., slash.*
- * Human-caused compacted layers from harvesting or other site activities (only natural restrictive layers are considered).*
- * Frozen or snow-covered soils.*

Ratings:

- * Suited - Little or no restrictions to surface mechanical site preparation.*
- * Poorly Suited - One or more restrictions reduce the effective and safe use of equipment.*
- * Unsited - One or more restrictions generally prevent the effective and safe use of equipment.*

Interpretation Name: **FOR - Potential Erosion Hazard (Off-Road/Off-Trail)**
Displayed in Report(s): MANU - Table FOR-2. Forestland Management w/fuzzy rating

FOR - POTENTIAL EROSION HAZARD (OFF-ROAD/OFF-TRAIL)

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

Ratings indicate the hazard or risk of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface.

Ratings assess:

- * Sheet and rill erosion from exposed soil surfaces caused by various silvicultural practices, grazing, mining, fire, firebreaks, etc.*
- * Activities that disturb the site resulting in 50 to 75 percent bare ground in the affected area*
- * The use of any equipment type or size and uncontrolled grazing by livestock.*

Ratings assume:

- * 50 to 75% exposed, roughened mineral surface layer*

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Potential Erosion Hazard (Off-Road/Off-Trail)**
Displayed in Report(s): MANU - Table FOR-2. Forestland Management w/fuzzy rating

Ratings do not assess:

- * *Clean tillage and other similar activities that disturb up to nearly 100 percent of the area and change the character of the soil*
- * *Histosols.*
- * *Individual precipitation or storm events.*
- * *The impact of gully erosion.*
- * *Sediment production/delivery ratio or streambank or streambed erosion for water courses on the site.*
- * *Ground disturbing activities on the amount of surface or subsurface water runoff.*

Rating Classes (Crisp):

- * *None - There is no erosion hazard associated with this activity.*
- * *Slight - Erosion is unlikely under ordinary climatic conditions.*
- * *Moderate - Some erosion is likely; control measures may be needed.*
- * *Severe - Erosion is very likely; control measures for vegetation re-establishment on bare areas and structural measures are advised.*
- * *Very Severe - Significant erosion is expected; loss of soil productivity and off-site damages are likely; control measures are costly and generally impractical.*

Interpretation Name: **FOR - Potential Erosion Hazard (Road/Trail)**
Displayed in Report(s): MANU - Table FOR-2. Forestland Management w/fuzzy rating

FOR - POTENTIAL EROSION HAZARD (ROAD/TRAIL)

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

The hazard or risk of soil loss from unsurfaced roads/trails. Refer to the National Forestry Manual for soil rating criteria.

Ratings assess:

- * *The force that natural precipitation events have to dislodge and move soil materials on roads/trails and firebreaks.*
- * *Activities on roads and trails that result in bare ground, compaction, and reshaping of the soil surface.*
- * *Use by trucks, skidders, off-road vehicles and other similar equipment.*
- * *The impact on compacted, bare road/trail surface using the representative value for slope gradient of the soil component*

Ratings assume:

- * *Roads and trails are generally linear, continuous, and narrow ranging up to 25 feet in width.*

Ratings do not assess:

- * *Frozen or snow-covered soil.*

Rating Classes (Crisp):

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Potential Erosion Hazard (Road/Trail)**
Displayed in Report(s): MANU - Table FOR-2. Forestland Management w/fuzzy rating

- * No Erosion Hazard - There is no erosion hazard associated with this activity.*
- * Slight - Little or no erosion is likely.*
- * Moderate - Some erosion is likely; occasional maintenance may be needed; simple erosion control measures needed.*
- * Severe - Significant erosion can be expected; roads require frequent maintenance; costly erosion control measures are needed*

Interpretation Name: **FOR - Potential Fire Damage Hazard**
Displayed in Report(s): MANU - Table FOR-5. Forestland Management w/fuzzy rating

FOR - POTENTIAL FIRE DAMAGE HAZARD

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

The potential hazard of damage to soil nutrient, physical, and biotic characteristics from fire.

Ratings assess:

** The impact of fires (prescribed or wildfire) of moderate fireline intensity (116-520 btu's/sec/ft) that provide the necessary heat to remove the duff layer and consume soil organic matter in the surface layer.*

Ratings assume:

- * Soils with a shallow surface layer lack the capacity to safely absorb the effects of fire.*
- * Steep slopes are more likely to erode if the protective duff layer is removed.*
- * Soil texture and rock fragment content relate to soil erodibility, vegetative recovery rate, and vegetative productivity.*
- * Medium textured soils, with their greater inherent water holding capacity, are more likely to be cooler and provide higher productivity potential*
- * Soils with large volumes of rock fragments transmit heat to a greater depth in a shorter period of time.*
- * Soils with less than 2 percent organic matter are more resistant to sheet and rill erosion and have greater water holding capacity.*

Ratings do not assess:

- * The time of year in which the fire occurs (winter versus summer).*
- * Fuel moisture content or volume.*
- * Whether conditions*

Rating Classes (Crisp):

- *None - No impact to the soil characteristics are expected.*
- * Low - Little negative impact to the soil characteristics are expected.*
- * Moderate - Negative impacts to the soil characteristic may occur.*
- * High - Negative impact to the soil characteristics are expected.*

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Potential Seedling Mortality**
Displayed in Report(s): MANU - Table FOR-5. Forestland Management w/fuzzy rating

FOR - POTENTIAL SEEDLING MORTALITY

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

The likelihood of death of naturally or artificially propagated tree seedlings, as influenced by soil characteristic, physiographic features and climatic conditions.

Ratings assess:

** The impact of soil, physiographic, and climatic conditions on the survivability of newly established tree seedlings*

Ratings assume:

** Site preparation is adequate for the establishment of tree seedlings.*

** Artificially propagated tree seedlings are of adequate size and quality, are adapted to the site, are planted during a time sufficient to assure initial root growth with respect to moisture and temperature, and proper planting techniques are employed.*

** Near normal monthly and yearly climatic conditions.*

Ratings do no assess:

** Effects of overstory tree canopy greater than 15 feet in height.*

** Effects of adjacent competing plants less than 15 feet in height.*

** Effects of seedling pests (rodent, herbivore, insect, etc.).*

Rating Classes (Crisp):

Low - Seedlings are expected to develop normally and become established.

Moderate - Root development is sufficiently retarded to cause death of some seedlings (up to 1 in 3) and establishment of surviving seedlings is delayed.

High - Seedlings are not expected to survive (at least 2 in 3 die) without special treatment or management.

Interpretation Name: **FOR - Road Suitability (Natural Surface)**
Displayed in Report(s): MANU - Table FOR-2. Forestland Management w/fuzzy rating

FOR - ROAD SUITABILITY (NATURAL SURFACE)

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

Suitability for using the natural surface of the soil component for roads by trucks for the transport of logs and other wood products from the site.

Ratings assess:

** The efficient and safe transport of forest products from the site.*

** The landscape in its natural setting.*

** Frequency and duration of flooding, ponding and depth and duration of water table.*

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Road Suitability (Natural Surface)**
Displayed in Report(s): MANU - Table FOR-2. Forestland Management w/fuzzy rating

- * The use of trucks (1/2-ton to log-transport capability).*
 - * Activities that disturb 100 percent of the soil surface area with rutting, puddling or displacement up to a depth of 18.*
- Ratings assume:
- * Vegetation and debris is cleared from an area sufficient in width for the road before use begins.*
 - * Using the natural setting of the soil without cut and fill construction.*
 - * Slopes are less than 20 percent gradient.*
 - * Use occurs during customary periods of such activity for the local area.*
 - * Roads are generally less than 1 mile in length with up to a 20-foot wide running surface.*

Ratings do not assess:

- * Non-soil obstacles, e.g., slash.*
- * Frozen or snow-covered soils.*

Rating Classes (Crisp):

- * Suited - Little or no restrictions to natural road suitability.*
- * Moderately Suited - One or more restrictions reduce site suitability.*
- * Poorly Suited - One or more restrictions generally make the use of the site for a natural road very difficult or unsafe.*

Interpretation Name: **FOR - Soil Rutting Hazard**
Displayed in Report(s): MANU - Table FOR-1. Forestland Management w/fuzzy rating

FOR - SOIL RUTTING HAZARD

Refer to section 537 of the National Forestry Manual for specific soil rating criteria.

Description:

Ratings indicate the hazard or risk of ruts in the uppermost soil surface layers by operation of forest equipment. Soil displacement and puddling (soil deformation and compaction) may occur simultaneously with rutting.

Ratings assess:

- * The operation of equipment on forest sites (3-10 passes) when the soil moisture is near field capacity.*
- * The use of standard rubber-tired vehicles (non-flotation tires).*
- * Year-long water tables < 12.*
- * Soil displacement and puddling which may affect aesthetics, groundwater hydrology, and productivity of the site.*

Ratings assume:

- * Rutting depths usually range from 2 to 24 and depends, in part, on the weight of equipment (including carried or pulled loads) and shape and size of wheels.*
- * Lack of organic/vegetation surface cover.*

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **FOR - Soil Rutting Hazard**
Displayed in Report(s): MANU - Table FOR-1. Forestland Management w/fuzzy rating

** Conditions occurs on soil with slopes and other characteristics that allow use of ground-based equipment.*

Ratings do not assess:

** Impacts of rutting on sloping sites that may channel surface water and affect hydrology.*

** Frozen soil within 24 of the surface.*

Rating Classes (Crisp):

** Slight - Little or no rutting.*

** Moderate - Ruts are likely.*

** Severe- Ruts readily.*

Interpretation Name: **HYDS-HYDRIC SOILS LIST**
Displayed in Report(s):

HYDRIC SOILS LIST INTERPRETATION, TEST MODEL, DO NOT COPY

HYDRIC SOIL CRITERIA (1995) with (1999) Taxonomic Updates:

- 1. All Histosols except Folists, or Histels except Folistels, or*
- 2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Pachic subgroups, or Cumulic subgroups that are:*
 - a. somewhat poorly drained with a water table equal to 0.0 foot(ft.) from the surface during the growing season, or*
 - b. poorly drained or very poorly drained and have either:*
 - (1) water table equal to 0.0 ft. during the growing season if textures are coarse sand, sand, or fine sand in all layers within 20 inches (in.), or for other soils, or*
 - (2) water table at less than or equal to 0.5 ft. from the surface during the growing season if permeability is equal to or greater than 6.0 in./hour (hr.) in any layer within 20 in., or*
 - (3) water table at less than or equal to 1.0 ft. from the surface during the growing season, if permeability is less than 6.0 in./hr. in any layer within 20 in., or*
- 3. Soils that are frequently ponded for long or very long duration during the growing season, or*
- 4. Soils that are frequently flooded for long or very long duration during the growing season.*
- 5. IF THE SOIL COMPONENT HAS NO DATA IN HORIZON TABLES OR NO DATA IN THE TAXONOMIC ORDER COLUMN, THEN THE SOIL COMPONENT WILL BE RATED "NO DATA".*
- 6. IF THE SOIL COMPONENT KIND IS "MISCELLANEOUS AREA" THEN THE HYDRIC CRITERIA CODE OR REASONS IN THE REPORT WILL SHOW "MISC. AREA".*

Interpretation Name: **URB/REC - Camp Areas**
Displayed in Report(s): MANU - Table REC-1. Recreation w/fuzzy rating

620.09 Recreational development.

(a) General.

(1) Soil interpretations for recreational development are to be used to guide the user in identifying and evaluating the suitability of the soil for

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Camp Areas**
Displayed in Report(s): MANU - Table REC-1. Recreation w/fuzzy rating

specific recreational purposes. The soil survey interpretation rating guides are applicable to both heavily and sparsely populated areas, depending upon the objectives of the user. The ratings are for soils in their present condition and do not consider present land use. The limitation rating for each interpretation is based on the influence of existing soil properties for that use. When a soil is rated for each use, the degree of the limitation and the most restrictive soil features are identified. Restrictive features for soils with limited or very limited ratings require changes to the original design or the application of corresponding conservation practices, or both, to overcome the limitations. Soils with unlimited ratings require no additional measures other than the normal local procedures used in site development and maintenance.

(2) Many soil survey areas in sparsely populated parts of the country have soil surveys of lower intensity. While some general observations may be made, onsite evaluation is required before the final site is selected.

(3) Soils subject to flooding are limited, in varying degrees, for recreational use by the duration and frequency of flooding and the season when it occurs. Onsite assessment of the duration and frequency of flooding is essential in planning recreational facilities.

(4) The ratings do not consider location and accessibility of the area, size and shape of the area, scenic quality, the ability of the soil to support vegetation, access to water, potential available sites for water impoundment, and either access to public sewers or capacity of the soil to absorb septic tank effluent. These features are extremely important considerations in evaluating a site and making the final site selection.

(5) The use of other applicable interpretations made for building site development, construction material, sanitary facilities, and water management help the user to develop alternatives for use in making their final decision. Depending upon the recreational use objectives, soil interpretations for woodland suitability, wildlife habitat suitability, or potential native plant community should also be a consideration in the final planning analysis. These latter interpretations help to maintain the aesthetic integrity of the recreational site.

Camp areas

Camp areas are tracts of land used intensively as sites for tents, trailers, campers, and the accompanying activities of outdoor living. Camp areas require such site preparation as shaping and leveling in the areas used for tents and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic.

The soils are rated on the basis of soil properties listed in Table 620-12, that influence the ease of developing camping areas and the performance of the camping area after development. Soil properties that influence trafficability and promote the growth of vegetation after heavy use are important. For tent or remote camp sites, the limitations would be less restrictive.

Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns in developing camp areas. However, areas associated with picnic areas may have steep slopes and rough terrain for aesthetic purposes. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. Soil properties that influence trafficability are texture of the surface layer, wetness, permeability, and large stones. The limitations of slow permeability and clayey surface texture are not as severe in dry regions of the country; however, silty soils may be more of a problem because they are dusty. Soil properties that influence the growth of plants are depth to bedrock or a cemented pan, permeability, and presence of toxic materials. Soils that are subject to flooding are particularly hazardous for camp areas because of the danger to life and property.

If the soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated SEVERE and the restrictive feature is listed as FRAGILE.

Table 620-12 Camp Areas.

LIMITS		RESTRICTIVE	
PROPERTY	SLIGHT	MODERATE	SEVERE FEATURE
1. USDA TEXTURE	---	---	ICE PERMAFROST
1a. TEXTURE MODIFIER	---	STV, BYV STX, BYX,	LARGE STONES
(SURFACE)	CBX, FLX,	CBV, FLV,	CNX, CRX,
	SHX, SYX		
1b. TEXTURE	---	---	SC, SIC, C TOO CLAYEY
(SURFACE LAYER)			
1c. TEXTURE (SURFACE	---	---	SC, SIC, C --- TOO CLAYEY
LAYER) TOR, UST,			
ARID, XER, OXI			
SUBORDERS, GREAT			
GROUPS, AND			
SUBGROUPS, OXISOLS			
1d. TEXTURE	LFS, LS	LCOS, VFS	COS, S, FS TOO SANDY

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Camp Areas**
Displayed in Report(s): MANU - Table REC-1. Recreation w/fuzzy rating

- (SURFACE LAYER) LFS, LS
WHEN FINER MATERIAL
<20")
- 1e. TEXTURE (TOR, ARID, --- SIL, SI, --- DUSTY
OR XER SUBGROUPS VFSL, L
& GREAT GROUPS)
 2. FLOODING NONE --- RARE, OCCAS, FLOODING
FREQ, V FREQ
 3. SLOPE (PCT) <8 8-15 >15 SLOPE
 4. PONDING --- --- + PONDING
 5. DEPTH TO HIGH >2.5 1.5-2.5 <1.5 WETNESS
WATER TABLE (FT)
 - 6.* STONINESS CLASS 1 2 3, 4, 5 TOO STONY
* see note below
 7. WEIGHT PERCENT <25 25-50 >50 SMALL STONES
2 mm-3" (SURFACE LAYER)
 8. PERMEABILITY >0.6 0.06-0.6 <0.06 PERCS SLOWLY
(0-40", IN/H)
 - 8a. PERMEABILITY (0-40", >0.06 <0.06 --- PERCS SLOWLY
IN/H) TOR, UST, ARID,
XER, SUBORDERS,
GREAT GROUPS AND
SUBGROUPS
 9. UNIFIED (SURFACE) --- --- PT EXCESS HUMUS
 10. DEPTH TO BEDROCK --- --- <20 DEPTH TO ROCK
(IN)
 11. DEPTH TO CEMENTED <20 CEMENTED PAN
 12. SODIUM ADSORPTION --- --- >13 EXCESS SODIUM
RATIO [surface]
 13. SALINITY (SURFACE <4 4-8 >8 EXCESS SALT
LAYER, MMHOS/CM)
 14. SOIL REACTION (pH) --- --- <3.5 TOO ACID
[surface]
- NOTE: #6 has been replaced with
6. STONINESS CLASS <=0.1% 0.1-3% >3% TOO STONY
(% cover surface fragment
size > 10")(250mm))

Interpretation Name: **URB/REC - Off-Road Motorcycle Trails**
Displayed in Report(s): MANU - Table REC-2. Recreation w/fuzzy rating

620.09 Recreational development.

(a) General.

(1) Soil interpretations for recreational development are to be used to guide the user in identifying and evaluating the suitability of the soil for specific recreational purposes. The soil survey interpretation rating guides are applicable to both heavily and sparsely populated areas, depending upon the objectives of the user. The ratings are for soils in their present condition and do not consider present land use. The limitation rating for each interpretation is based on the influence of existing soil properties for that use. When a soil is rated for each use, the degree of the limitation and the most restrictive soil features are identified. Restrictive features for soils with limited or very limited ratings require changes to the original design or the application of corresponding conservation practices, or both, to overcome the limitations. Soils with unlimited ratings require no additional measures other than the normal local procedures used in site development and maintenance.

(2) Many soil survey areas in sparsely populated parts of the country have soil surveys of lower intensity. While some general observations may be made, onsite evaluation is required before the final site is selected.

(3) Soils subject to flooding are limited, in varying degrees, for recreational use by the duration and frequency of flooding and the season when it occurs. Onsite assessment of the duration and frequency of flooding is essential in planning recreational facilities.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Off-Road Motorcycle Trails**
Displayed in Report(s): MANU - Table REC-2. Recreation w/fuzzy rating

(4) The ratings do not consider location and accessibility of the area, size and shape of the area, scenic quality, the ability of the soil to support vegetation, access to water, potential available sites for water impoundment, and either access to public sewers or capacity of the soil to absorb septic tank effluent. These features are extremely important considerations in evaluating a site and making the final site selection.

(5) The use of other applicable interpretations made for building site development, construction material, sanitary facilities, and water management help the user to develop alternatives for use in making their final decision. Depending upon the recreational use objectives, soil interpretations for woodland suitability, wildlife habitat suitability, or potential native plant community should also be a consideration in the final planning analysis. These latter interpretations help to maintain the aesthetic integrity of the recreational site.

(f) Off-road motorcycle trails.

(1) Off-road motorcycle trails are primarily for recreational use. Trails for other off-road vehicles may have similar criteria. Little or no preparation is done to the trail, and the surface is not vegetated or surfaced. Considerable compaction of the soil on the trail is expected.

(2) Soils are rated based on the properties and qualities that influence erodibility, revegetation, trafficability, and dustiness as shown in Table 620-16. Considerations for desirable off-road challenges are not included. The soil properties considered are stoniness, slope, wetness, texture of the surface layer, and flooding. Slope affects the soil erodibility. Large stones affect the configuration of the trail. Small stones affect trafficability. Wetness and flooding affect revegetation and frequency of use. Surface texture affects erodibility, trafficability, revegetation, and probability of dust. If conditions indicate traffic damage, the soil is rated SEVERE and the restrictive feature is listed as FRAGILE.

Table 620-REC 5 Off-Road Motorcycle Trails.

RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE
1. TEXTURE MODIFIER --- --- PF PERMAFROST
1a. TEXTURE MODIFIER OF --- STV, BYV STX, BYX, TOO COBBLY
SURFACE LAYER CBX, FLX,
CBV, FLV,
CNX
1b. TEXTURE OF SURFACE --- --- SC, SIC, C TOO CLAYEY
LAYER
1c. TEXTURE OF SURFACE --- SC, SIC, C --- TOO CLAYEY
LAYER WHERE
TAXONOMIC MOISTURE
CLASS IS ARIDIC, USTIC,
XERIC OR WHERE
SOIL ORDER IS OXISOLS
1d. TEXTURE OF SURFACE --- LCOS, VFS, COS, S, FS TOO SANDY
LAYER WHERE FINER LFS, LS
MATERIAL >50 CM
1e. TEXTURE OF SURFACE LFS, LS LCOS, VFS COS, S, FS TOO SANDY
LAYER WHERE FINER
MATERIAL <50 CM
1f. TEXTURE OF SURFACE --- SIL, SI, --- DUSTY
LAYER WHERE VFSL, L
TAXONOMIC MOISTURE ASHY
CLASS IS ARIDIC, OR
XERIC
2. PONDING FREQUENCY --- --- RARE TO FREQ PONDING
3. DEPTH (CM) TO WET SOIL >60 30-60 <30 WETNESS
MOISTURE STATUS
5. UNIFIED IN SURFACE --- --- PT EXCESS HUMUS
LAYER
6. SLOPE GRADIENT (PCT) <25 25-40 >40 SLOPE
7. WEIGHT PERCENT OF >65 SMALL STONES
2 TO 75 MM IN SURFACE
LAYER
8. FLOODING FREQUENCY NONE TO FREQ, VERY --- FLOODING
OCCAS FREQ

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Paths and Trails**
Displayed in Report(s): MANU - Table REC-2. Recreation w/fuzzy rating

620.09 Recreational development.

(a) General.

(1) Soil interpretations for recreational development are to be used to guide the user in identifying and evaluating the suitability of the soil for specific recreational purposes. The soil survey interpretation rating guides are applicable to both heavily and sparsely populated areas, depending upon the objectives of the user. The ratings are for soils in their present condition and do not consider present land use. The limitation rating for each interpretation is based on the influence of existing soil properties for that use. When a soil is rated for each use, the degree of the limitation and the most restrictive soil features are identified. Restrictive features for soils with limited or very limited ratings require changes to the original design or the application of corresponding conservation practices, or both, to overcome the limitations. Soils with unlimited ratings require no additional measures other than the normal local procedures used in site development and maintenance.

(2) Many soil survey areas in sparsely populated parts of the country have soil surveys of lower intensity. While some general observations may be made, onsite evaluation is required before the final site is selected.

(3) Soils subject to flooding are limited, in varying degrees, for recreational use by the duration and frequency of flooding and the season when it occurs. Onsite assessment of the duration and frequency of flooding is essential in planning recreational facilities.

(4) The ratings do not consider location and accessibility of the area, size and shape of the area, scenic quality, the ability of the soil to support vegetation, access to water, potential available sites for water impoundment, and either access to public sewers or capacity of the soil to absorb septic tank effluent. These features are extremely important considerations in evaluating a site and making the final site selection.

(5) The use of other applicable interpretations made for building site development, construction material, sanitary facilities, and water management help the user to develop alternatives for use in making their final decision. Depending upon the recreational use objectives, soil interpretations for woodland suitability, wildlife habitat suitability, or potential native plant community should also be a consideration in the final planning analysis. These latter interpretations help to maintain the aesthetic integrity of the recreational site.

(e) Paths and trails.

(1) Paths and trails are used for walking, horseback riding, and similar uses and require little or no cutting or filling. The soils are rated based on the properties and qualities that influence trafficability and erodibility, as shown in Table 620-15.

(2) These soil properties and qualities are stoniness, wetness, texture of the surface layer, slope, flooding, erodibility, and, in dry regions, dustiness. If the soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated SEVERE and the restrictive feature is listed as FRAGILE.

Table 620-15 Paths and Trails.

RESTRICTIVE

PROPERTY UNLIMITED LIMITED VERY LIMITED FEATURE

1. TEXTURE MODIFIER --- --- PF PERMAFROST

1a. TEXTURE MODIFIER OF --- STV, BYV STX, BYX, TOO COBBLY

OF SURFACE CBX, FLX,

CBV, FLV,

CNX

1b. TEXTURE OF SURFACE --- --- SC, SIC, C TOO CLAYEY LAYER

1c. TEXTURE OF SURFACE --- SC, SIC, C --- TOO CLAYEY LAYER WHERE

TAXONOMIC MOISTURE

CLASS IS ARIDIC, XERIC,

OR USTIC

1d. TEXTURE OF SURFACE --- LCOS, VFS, COS, S, FS TOO SANDY LAYER LFS, LS

1e. TEXTURE OF SURFACE LFS, LS LCOS, VFS COS, S, FS TOO SANDY LAYER WHERE FINER

MATERIAL <50 CM

1f. TEXTURE OF SURFACE --- SIL, SI, --- DUSTY

LAYER WHERE VFSL, L

TAXONOMIC MOISTURE

CLASS IS ARIDIC, OR

XERIC

2. PONDING FREQUENCY --- --- RARE TO FREQ PONDING

3. DEPTH (CM) TO WET SOIL >60 30-60 <30 WETNESS

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Paths and Trails**
Displayed in Report(s): MANU - Table REC-2. Recreation w/fuzzy rating

MOISTURE STATUS

4. UNIFIED IN SURFACE --- --- PT EXCESS HUMUS LAYER
5. SLOPE GRADIENT (PCT) <15 15-25 >25 SLOPE
6. WEIGHT PERCENT OF --- --- >65 SMALL STONES 2 TO 75 MM IN SURFACE LAYER
7. WEIGHT PERCENT OF <25 25-50 >50 LARGE STONES >7.5 CM IN SURFACE LAYER
8. FLOODING FREQUENCY NONE TO FREQ, VERY --- FLOODING OCCAS FREQ
9. EROSION FACTOR (K) IN --- --- >.35 ERODES EASILY SURFACE LAYER WHERE SLOPES >8%

Interpretation Name: **URB/REC - Picnic Areas**
Displayed in Report(s): MANU - Table REC-1. Recreation w/fuzzy rating

620.09 Recreational development.

General.

(1) Soil interpretations for recreational development are to be used to guide the user in identifying and evaluating the suitability of the soil for specific recreational purposes. The soil survey interpretation rating guides are applicable to both heavily and sparsely populated areas, depending upon the objectives of the user. The ratings are for soils in their present condition and do not consider present land use. The limitation rating for each interpretation is based on the influence of existing soil properties for that use. When a soil is rated for each use, the degree of the limitation and the most restrictive soil features are identified. Restrictive features for soils with limited or very limited ratings require changes to the original design or the application of corresponding conservation practices, or both, to overcome the limitations. Soils with unlimited ratings require no additional measures other than the normal local procedures used in site development and maintenance.

(2) Many soil survey areas in sparsely populated parts of the country have soil surveys of lower intensity. While some general observations may be made, onsite evaluation is required before the final site is selected.

(3) Soils subject to flooding are limited, in varying degrees, for recreational use by the duration and frequency of flooding and the season when it occurs. Onsite assessment of the duration and frequency of flooding is essential in planning recreational facilities.

(4) The ratings do not consider location and accessibility of the area, size and shape of the area, scenic quality, the ability of the soil to support vegetation, access to water, potential available sites for water impoundment, and either access to public sewers or capacity of the soil to absorb septic tank effluent. These features are extremely important considerations in evaluating a site and making the final site selection.

(5) The use of other applicable interpretations made for building site development, construction material, sanitary facilities, and water management help the user to develop alternatives for use in making their final decision. Depending upon the recreational use objectives, soil interpretations for woodland suitability, wildlife habitat suitability, or potential native plant community should also be a consideration in the final planning analysis. These latter interpretations help to maintain the aesthetic integrity of the recreational site.

(c) Picnic areas.

(1) Picnic areas are natural or landscaped tracts used primarily for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking lots. Soils are rated on the basis of properties that influence the development costs of shaping the site, trafficability, and the growth of vegetation after development.

(2) Slope and stoniness are the main concerns in developing picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. As shown in Table 620-REC 2, soil properties that influence trafficability are texture of the surface layer, wetness, permeability, and large stones. The limitations of slow permeability and clayey surface texture are not as severe in dry regions of the country; however, silty soils may be more of a problem because they are dusty. Soil properties that influence the growth of plants are depth to bedrock, permeability, and the presence of toxic materials.

(3) If the soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated **VERY LIMITED** and the restrictive feature is listed as **FRAGILE**.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Picnic Areas**
Displayed in Report(s): MANU - Table REC-1. Recreation w/fuzzy rating

Table 620-13 Picnic Areas.

PROPERTY UNLIMITED LIMITED VERY LIMITED RESTRICTIVE
FEATURE
1. TEXTURE MODIFIER --- --- PF PERMAFROST
1a. TEXTURE MODIFIER --- STV, BYV STX, BYX, LARGE STONES
IN SURFACE CB, FL CBX, FLX,
CBV, FLV,
CNX
1b. TEXTURE IN SURFACE --- --- SC, SIC, C TOO CLAYEY
LAYER
1c. TEXTURE OF SURFACE --- SC, SIC, C --- TOO CLAYEY
LAYER WHERE
TAXONOMIC MOISTURE
CLASS IS ARIDIC, USTIC,
XERIC OR WHERE
SOIL ORDER IS OXISOLS
1d. TEXTURE IN SURFACE --- LCOS, VFS, COS, S, FS TOO SANDY
LAYER WHERE FINER LFS, LS
MATERIAL >50 CM
1e. TEXTURE IN SURFACE LFS, LS LCOS, VFS, COS, S, FS TOO SANDY
LAYER WHERE FINER
MATERIAL <50 CM
1f. TEXTURE IN SURFACE --- SIL, SI, --- DUSTY
LAYER WHERE VFSL, L
TAXONOMIC MOISTURE
CLASS IS ARIDIC OR
XERIC
2. SLOPE GRADIENT (PCT) <8 8-15 >15 SLOPE
3. FLOODING FREQUENCY NONE TO FREQ FLOODING
OCCAS
4. PONDING FREQUENCY --- --- RARE TO FREQ PONDING
5. DEPTH (CM) TO WET SOIL >75 30-75 <30 WETNESS
MOISTURE STATUS
6. PERMEABILITY (ms-1) >4 0.42-4 <0.42 PERCS SLOWLY
WITHIN 0 TO 100 CM
6a. PERMEABILITY (ms-1) >0.42 <0.42 PERCS SLOWLY
WITHIN 0 TO 100 CM
WHERE TAXONOMIC
MOISTURE CLASS IS
USTIC, ARIDIC, OR XERIC
7. UNIFIED (SURFACE) --- --- PT EXCESS HUMUS
8. WEIGHT PERCENT OF <25 25-50 >50 SMALL STONES
2 TO 75 MM IN SURFACE
LAYER
9. SODIUM ADSORPTION --- --- >13 EXCESS SODIUM
RATIO
10. SALINITY IN SURFACE <4 4-8 >8 EXCESS SALT
LAYER (MMHOS/CM)
11. SOIL REACTION (pH) --- --- <3.5 TOO ACID
12. RESTRICTION DEPTH(CM) <50 DEPTH TO ROCK
WHERE RESTRICTION
KIND IS LITH
13. RESTRICTION DEPTH(CM) <50 CEMENTED PAN
WHERE RESTRICTION
KIND IS DURIC OR CALC

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Playgrounds**
Displayed in Report(s): MANU - Table REC-1. Recreation w/fuzzy rating

620.09 Recreational development.

(a) General.

(1) Soil interpretations for recreational development are to be used to guide the user in identifying and evaluating the suitability of the soil for specific recreational purposes. The soil survey interpretation rating guides are applicable to both heavily and sparsely populated areas, depending upon the objectives of the user. The ratings are for soils in their present condition and do not consider present land use. The limitation rating for each interpretation is based on the influence of existing soil properties for that use. When a soil is rated for each use, the degree of the limitation and the most restrictive soil features are identified. Restrictive features for soils with limited or very limited ratings require changes to the original design or the application of corresponding conservation practices, or both, to overcome the limitations. Soils with unlimited ratings require no additional measures other than the normal local procedures used in site development and maintenance.

(2) Many soil survey areas in sparsely populated parts of the country have soil surveys of lower intensity. While some general observations may be made, onsite evaluation is required before the final site is selected.

(3) Soils subject to flooding are limited, in varying degrees, for recreational use by the duration and frequency of flooding and the season when it occurs. Onsite assessment of the duration and frequency of flooding is essential in planning recreational facilities.

(4) The ratings do not consider location and accessibility of the area, size and shape of the area, scenic quality, the ability of the soil to support vegetation, access to water, potential available sites for water impoundment, and either access to public sewers or capacity of the soil to absorb septic tank effluent. These features are extremely important considerations in evaluating a site and making the final site selection.

(5) The use of other applicable interpretations made for building site development, construction material, sanitary facilities, and water management help the user to develop alternatives for use in making their final decision. Depending upon the recreational use objectives, soil interpretations for woodland suitability, wildlife habitat suitability, or potential native plant community should also be a consideration in the final planning analysis. These latter interpretations help to maintain the aesthetic integrity of the recreational site.

(d) Playgrounds.

(1) Playgrounds are areas used intensively for games, such as baseball and football, and similar activities. Playgrounds require a nearly level soil that is free of stones and that can withstand heavy foot traffic and still maintain adequate vegetation. Soils are rated on the basis of properties that influence the cost of shaping, trafficability, and the growth of vegetation.

(2) Slope and stoniness are the main concerns in developing playgrounds. For good trafficability, the surface of playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. As shown in Table 620-REC 3, soil properties that influence trafficability are texture of the surface layer, wetness, permeability, and large stones. The limitations of slow permeability and clayey surface texture are not as severe in dry regions of the country; however, silty soils may be more of a problem because they are dusty. Soil properties that influence the growth of plants are depth to bedrock, permeability, and the presence of toxic materials.

(3) If the soil properties or vegetative conditions observed suggest the probability of damage by traffic, the soil is rated VERY LIMITED and the restrictive feature is listed as FRAGILE.

Table 620-14 Playgrounds.

RESTRICTIVE

PROPERTY UNLIMITED LIMITED VERY LIMITED FEATURE

1. TEXTURE MODIFIER --- --- PF PERMAFROST

1a. TEXTURE MODIFIER OF --- ST STV, BYV, LARGE STONES

SURFACE LAYER STX, BYX,

CBX, FLX,

CBV, FLV,

CNX, CB,

FL

1b. TEXTURE OF SURFACE --- --- SC, SIC, C TOO CLAYEY LAYER

1c. TEXTURE OF SURFACE --- SC, SIC, C --- TOO CLAYEY LAYER WHERE

TAXONOMIC MOISTURE

CLASS IS ARIDIC, USTIC,

OR XERIC

1d. TEXTURE OF SURFACE --- LCOS, VFS, COS, S, FS TOO SANDY LAYER LFS, LS

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **URB/REC - Playgrounds**
Displayed in Report(s): MANU - Table REC-1. Recreation w/fuzzy rating

1e. TEXTURE OF SURFACE LFS, LS LCOS, VFS COS, S, FS TOO SANDY
LAYER WHERE FINER
MATERIAL <50 CM
1f. TEXTURE OF SURFACE --- SIL, SI, --- DUSTY
LAYER WHERE VFSL, L
TAXONOMIC MOISTURE
CLASS IS ARIDIC, USTIC,
OR XERIC
2. SLOPE GRADIENT(PCT) <2 2-6 >6 SLOPE
3. PONDING FREQUENCY --- RARE TO FREQ PONDING
4. DEPTH (CM) TO WET SOIL >75 45-75 <45 WETNESS
MOISTURE STATUS
5. FLOODING FREQUENCY NONE TO OCCAS FREQ TO VERY FLOODING
RARE FREQ
6. WEIGHT PERCENT OF <10 10-25 >25 SMALL STONES
2 TO 75 MM OF SURFACE
LAYER
7. UNIFIED IN SURFACE --- PT EXCESS HUMUS
LAYER
8. RESTRICTION DEPTH(CM) >100 50-100 <50 DEPTH TO ROCK
WHERE RESTRICTION
KIND IS LITH AND
WHERE SLOPE
GRADIENT >2%
8a. RESTRICTION DEPTH(CM) >50 --- <50 DEPTH TO ROCK
WHERE RESTRICTION
KIND IS LITH AND
WHERE SLOPE
GRADIENT <2%
9. RESTRICTION DEPTH(CM) >100 50-100 <50 CEMENTED PAN
WHERE RESTRICTION
KIND IS DURIC OR CALC
WHERE SLOPE
GRADIENT >2% (CM)
10. RESTRICTION DEPTH(CM) >50 --- <50 CEMENTED PAN
WHERE RESTRICTION
KIND IS DURIC OR CALC
WHERE SLOPE
GRADIENT <2% (CM)
11. PERMEABILITY WITHIN >0.6 0.06-0.6 <0.06 PERCS SLOWLY
0 TO 100 CM (IN/H)
11a. PERMEABILITY WITHIN >0.06 <0.06 PERCS SLOWLY
0 TO 100 CM WHERE
TAXONOMIC MOISTURE
CLASS IS ARIDIC, XERIC,
OR USTIC
12. SODIUM ADSORPTION --- >13 EXCESS SODIUM
RATIO
13. SALINITY IN SURFACE <4 4-8 >8 EXCESS SALT
LAYER (MMHOS/CM)
14. SOIL REACTION (pH) --- <3.5 TOO ACID

Interpretation Name: **WMS - Embankments, Dikes, and Levees**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

National Soil Survey Handbook, 1993, Sec. 620

620.10 Water Management.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **WMS - Embankments, Dikes, and Levees**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

(a) General.

(1) Soil survey interpretations are developed for use in evaluating the potential of the soil in the application of various water management practices. This application may involve the movement of water to or from a site, holding water on a site, or securing a water source. The interpretation guides are applicable to both heavily and sparsely populated areas. Ratings are for the soils are rated in their present condition and do not consider present land use. Soil limitation ratings and associated restrictive features are given for ponds and reservoir areas; embankments, dikes, and levees; and excavated ponds. If a soil is rated as limited or very limited for these uses, changes need to be made to the original design to overcome the restricting soil properties or a more suitable site should be selected. Soils that are unlimited are favorable for the rated use.

(2) Only restrictive features are given for drainage, irrigation, terraces and diversions, and grassed waterways because these uses are not rated. Any restrictions in use will ultimately affect design, layout, construction, management, and performance. The impact on the rehabilitation and growth of vegetation, which minimizes water erosion, is an important consideration for many of these interpretations.

(3) Some soil surveys are moderate or low in intensity or are more general. These surveys are helpful in the evaluation of alternative sites; however, onsite investigations are required to design projects. The interpretations for water management may appear to be useful only in agricultural development, but they have potential for broader application. Use of these guides helps to meet various planning needs including building site development and recreational development, and determine site suitabilities for rangeland, forest land, or wildlife habitat. Livestock or wildlife watering facilities are examples of the potential application of specific guides.

(4) If the present general or specific headings do not meet the desired application in the local area, the user may request a change to the output names. If repackaging of the headings is requested, it is necessary to assure that the proposed application is within the original intent of the interpretation rating guides. In many local areas, implementation of the water management interpretations can make the difference between site enhancement and partial or complete site degradation and failure that impacts the soil resource.

(c) Embankments, dikes, and levees.

((1) Embankments, dikes, and levees are raised structures of soil material that are constructed to impound water or protect land against overflow. They generally are less than 6 meters (20 feet) high, are constructed of "homogeneous" soil material (without a core zone), and are compacted to medium density. Embankments that have zoned construction (core and shell) are not considered.

(2) As shown in Table 620-WMS 2, ratings are made for the soil as a source of material for or embankment fills. The rating is given for the whole soil, from the surface to a depth of about 150 cm (5 feet), based on the assumption that soil horizons will be mixed in loading, dumping, and spreading. The ratings do not indicate the suitability of the undisturbed soil for supporting the embankment. Soil properties to a depth greater than the embankment height have an effect on the performance and safety of the embankment. Generally, deeper onsite geologic investigations must be made to determine these important properties. Low-density silts and clays in the supporting foundation generally have excessive settlement and low strength. Loose soils in arid regions undergo much settlement very rapidly upon becoming saturated as water is impounded. These soils generally do not provide adequate support for embankments.

(3) Embankments, dikes, and levees require soil material that is resistant to seepage, piping, and erosion and that has favorable compaction characteristics. Organic soils are not suitable because of high compression, low strength, and unpredictable permeability. When compacting with tamping rollers (sheepsfoot rollers) or pneumatic rollers, stones over 15 cm (6 inches) in size must be removed; therefore, stony soils are limited for this use. If a water table is present, the depth of usable material and the trafficability are affected.

(4) The content of sodium and salts affects the capability for plant growth on embankment surfaces. These properties may also indicate dispersive soils that are highly erosive and susceptible to piping. Soils that contain gypsum may have piping and uneven settling.

Table 620-WMS 2 Embankments, Dikes, and Levees.

LIMITS RESTRICTIVE
PROPERTY UNLIMITED LIMITED VERY LIMITED FEATURE

1.TEXTURE MODIFIER --- --- PF PERMAFROST

2.LAYER THICKNESS (CM) >150 75-150 <75 THIN LAYER

3.UNIFIED FOR THE --- --- GW, GP, SW, SEEPAGE
THICKEST LAYER SP, GW-GM,
WITHIN 25 TO 150 CM GP-GM, SW-SM,
SP-SM, SM, GM

3a.UNIFIED FOR THE --- SM, GM GW, GP, SW, SEEPAGE
THICKEST LAYER SP, GW-GM,
WITHIN 25 TO 150 CM GP-GM, SW-SM,
WHERE >20% PASSES SP-SM

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **WMS - Embankments, Dikes, and Levees**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

#200 SIEVE

3b.UNIFIED FOR THE SM, GM --- GW, GP, SW, SEEPAGE
THICKEST LAYER SP, GW-GM,
WITHIN 25 TO 150 CM) GP-GM, SW-SM,
WHERE >30% PASSES SP-SM
#200 SIEVE

3c.UNIFIED FOR THE --- GM, CL ML, SM, SP, PIPING
THICKEST LAYER CL-ML
WITHIN 25 TO 150 CM

3d.UNIFIED FOR THE CL GM ML, SM, SP, PIPING
THICKEST LAYER CL-ML
WITHIN 25 TO 150 CM
WHERE PI>15

3e.UNIFIED FOR THE GM CL ML, SM, SP, PIPING
THICKEST LAYER CL-ML
WITHIN 25 TO 150 CM
WHERE <35% PASSES
#200 & <50% PASSES #40
& <65% PASSES #10 SIEVE

3f.UNIFIED FOR THE GM, CL, ML SM, SP, PIPING
THICKEST LAYER) CL-ML
WITHIN 25 TO 150 CM
WHERE PI>10

3g.UNIFIED FOR THE GM, CL, ML, CL-ML PIPING
THICKEST LAYER SM, SP
WITHIN 25 TO 150 CM
WHERE <70% PASSES #40
& <90% PASSES #10 SIEVE

3h.UNIFIED FOR THE SM, SP GM, CL ML, CL-ML PIPING
THICKEST LAYER
WITHIN 25 TO 150 CM
WHERE <60% PASSES #40
& <75% PASSES #10 SIEVE

3i.UNIFIED FOR THE --- --- OL, OH, PT EXCESS HUMUS
THICKEST LAYER
WITHIN 25 TO 150 CM

3j.UNIFIED FOR THE --- --- MH, CH HARD TO PACK
THICKEST LAYER
WITHIN 25 TO 150 CM

3k.UNIFIED FOR THE --- CH MH HARD TO PACK
THICKEST LAYER
WITHIN 25 TO 150 CM
WHERE PI<40)

4.WEIGHT PERCENT <15 15-35 >35 LARGE STONES
>7.5 cm (WEIGHT
AVERAGE OF
0 TO 100 CM)

5.PONDING FREQUENCY --- --- RARE TO FREQ PONDING

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **WMS - Embankments, Dikes, and Levees**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

6.DEPTH (CM) TO WET >120 60-120 <60 WETNESS
SOIL MOISTURE STATUS
THAT IS CONTINUOUS
FOR ALL HORIZONS
BELOW

6a.DEPTH (CM) TO WET >90 30-90 <30 WETNESS
SOIL MOISTURE STATUS
THAT IS DISCONTINUOUS
IN HORIZONS BELOW

7.SODIUM ADSORPTION --- --- >13 EXCESS SODIUM
RATIO (0-40")

8.SALINITY (MMHOS/CM) <8 8-16 >16 EXCESS SALT
WITHIN 0 TO 150 CM

Interpretation Name: **WMS - Excavated Ponds (Aquifer-fed)**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

If soil properties within 150 cm (60 in) of the soil surface are construction or performance limitations for pond reservoir areas than there is a potential for pond reservoirs built on these soil to be costly to construct or to fail.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.10 Water Management.

(a) General.

(1) Soil survey interpretations are developed for use in evaluating the potential of the soil in the application of various water management practices. This application may involve the movement of water to or from a site, holding water on a site, or securing a water source. The interpretation guides are applicable to both heavily and sparsely populated areas. Ratings are for the soils as they are in their present condition and do not consider present land use. Soil limitation ratings and associated restrictive features are given for ponds and reservoir areas; embankments, dikes, and levees; and excavated ponds. If a soil is rated as having moderate or severe limitations for these uses, changes need to be made to the original design to overcome the restricting soil properties or a more suitable site should be selected. Soils that have slight limitations are favorable for the rated use.

(2) Only restrictive features are given for drainage, irrigation, terraces and diversions, and grassed waterways because these uses are not rated. Any restrictions in use will ultimately affect design, layout, construction, management, and performance. The impact on the rehabilitation and growth of vegetation, which minimizes water erosion, is an important consideration for many of these interpretations.

(3) Some soil surveys are moderate or low in intensity or are more general. These surveys are helpful in the evaluation of alternative sites; however, onsite investigations are required to design projects. The interpretations for water management may appear to be useful only in agricultural development, but they have potential for broader application. Use of these guides helps to meet various planning needs including building site development and recreational development, and determine site suitability for rangeland, forest land, or wildlife habitat. Livestock or wildlife watering facilities are examples of the potential application of specific guides.

(4) If the present general or specific headings do not meet the desired application in the local area, the user may request a change to the output names. If repackaging of the headings is requested, it is necessary to assure that the proposed application is within the original intent of the interpretation rating guides. In many local areas, implementation of the water management interpretations can make the difference between site enhancement and partial or complete site degradation and failure that impacts the soil resource.

(d) Excavated ponds (aquifer-fed).

(1) An aquifer-fed excavated pond is a body of water created by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 90 centimeters (3 feet) or more above the original surface.

(2) As shown in Table 620-WMS 3, the soil properties and qualities that affect aquifer-fed excavated ponds are depth to a permanent water table, permeability of the aquifer, and quality of water as determined by inference from the salinity of the soil. Large stones are also considered because of their effect on the ease of excavation.

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **WMS - Excavated Ponds (Aquifer-fed)**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

Ames Description Prior to 1996:

Table 620-WMS 3 Excavated Ponds (Aquifer-Fed).

LIMITS RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST

1a. TEXTURE --- COS, G, SG S, FS, VFS, CUTBANKS
(BELOW 10") LCOS, LS, CAVE
LFS, LVFS

2. DEPTH TO HIGH <2 2-5 DEEP TO WATER
WATER TABLE
APPARENT (FT)

2a. DEPTH TO HIGH >5 NO WATER
WATER TABLE
APPARENT (FT)

2b. DEPTH TO HIGH --- --- + NO WATER
WATER TABLE
PERCHED (FT)

2c. DEPTH TO HIGH NO WATER
WATER TABLE
(IF NO WATER)

3. DEPTH TO BEDROCK >60 40-60 <40 DEPTH TO ROCK
HARD, (IN)

4. PERMEABILITY >2.0 0.6-2.0 <0.6 SLOW REFILL
(BELOW 10", IN/H)

5. SALINITY (BELOW <8 8-16 >16 SALTY WATER
10", MMHOS/CM)

6. WEIGHT PERCENT <25 25-50 >50 LARGE STONES
>3" (WEIGHTED
AV. 0-40")

Interpretation Name: **WMS - Pond Reservoir Area**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

If soil properties within 150 cm (60 in) of the soil surface are construction or performance limitations for pond reservoir areas than there is a potential for pond reservoirs built on these soil to be costly to construct or to fail.

Part 620 - Soil Interpretations Rating Guides (430-VI-NSSH, 1993)

620.10 Water Management.

(a) General.

(1) Soil survey interpretations are developed for use in evaluating the potential of the soil in the application of various water management practices. This application may involve the movement of water to or from a site, holding water on a site, or securing a water source. The interpretation guides are applicable to both heavily and sparsely populated areas. Ratings are for the soils are rated in their present condition and do not consider present land use. Soil limitation ratings and associated restrictive features are given for ponds and reservoir areas; embankments,

Dynamic Metadata - Soil Interpretation Descriptions

Interpretation Name: **WMS - Pond Reservoir Area**
Displayed in Report(s): MANU - Table WMS-1. Water Management w/fuzzy rating

dikes, and levees; and excavated ponds. If a soil is rated as having moderate or severe limitations for these uses, changes need to be made to the original design to overcome the restricting soil properties or a more suitable site should be selected. Soils that have slight limitations are favorable for the rated use.

(2) Only restrictive features are given for drainage, irrigation, terraces and diversions, and grassed waterways because these uses are not rated. Any restrictions in use will ultimately affect design, layout, construction, management, and performance. The impact on the rehabilitation and growth of vegetation, which minimizes water erosion, is an important consideration for many of these interpretations.

(3) Some soil surveys are moderate or low in intensity or are more general. These surveys are helpful in the evaluation of alternative sites; however, onsite investigations are required to design projects. The interpretations for water management may appear to be useful only in agricultural development, but they have potential for broader application. Use of these guides helps to meet various planning needs including building site development and recreational development, and determine site suitabilities for rangeland, forest land, or wildlife habitat. Livestock or wildlife watering facilities are examples of the potential application of specific guides.

(4) If the present general or specific headings do not meet the desired application in the local area, the user may request a change to the output names. If repackaging of the headings is requested, it is necessary to assure that the proposed application is within the original intent of the interpretation rating guides. In many local areas, implementation of the water management interpretations can make the difference between site enhancement and partial or complete site degradation and failure that impacts the soil resource.

(b) Pond reservoir area.

(1) A pond reservoir area is an area that holds water behind a dam or embankment.

(2) The soils best suited to this use have a low seepage potential, which is determined by permeability and depth to fractured or permeable bedrock, to a cemented pan, or to other permeable material. As shown in Table 620-28, the soil is rated to a depth of 60 inches on its properties and qualities as a natural barrier against seepage into deeper layers, without regard to cutoff trenches or other features that may be installed under the pond embankment. Excessive slope in the direction perpendicular to the axis of the pond embankment seriously reduces the storage capacity of the reservoir area.

Ames Description Prior to 1996:

Table 620-28 Pond Reservoir Area.

Depth to bedrock criteria modified on 9/00 by rdn to account for the difference in soft and hard bedrock during excavation. Legacy criteria is in {}.

LIMITS RESTRICTIVE
PROPERTY SLIGHT MODERATE SEVERE FEATURE

1. USDA TEXTURE --- --- ICE PERMAFROST
- 1a. TEXTURE --- --- MARL, GYP SEEPAGE
(ALL DEPTHS)
2. PERMEABILITY <0.6 0.6-2.0 >2.0 SEEPAGE
(IN/H, 20-60")
3. DEPTH TO BEDROCK >60 20-60 <20 DEPTH TO ROCK
HARD (IN)
- 3a. DEPTH TO BEDROCK >60 0-60 DEPTH TO ROCK
SOFT (IN) {>60} {20-60} {<20}
4. DEPTH TO CEMENTED >60 20-60 <20 CEMENTED PAN
PAN (IN)
5. SLOPE (PCT) <3 3-8 >8 SLOPE